CHAPTER 135
TECHNICAL STANDARDS AND CORRECTIVE ACTION REQUIREMENTS FOR OWNERS AND OPERATORS OF UNDERGROUND STORAGE TANKS
[Prior to 12/3/86, Water, Air and Waste Management[900]]

567—135.1(455B) Authority, purpose and applicability.

135.1(1) *Authority.* Iowa Code chapter 455B, division IV, part 8, authorizes the department to regulate underground tanks used for storage of regulated substances, and to adopt rules relating to detection, prevention and correction of releases of regulated substances from such tanks, maintenance of financial responsibility by owners or operators of such tanks, new tank performance standards, notice and reporting requirements, and designation of regulated substances.

135.1(2) *Purpose.* The purpose of these rules is to protect the public health and safety and the natural resources of Iowa by timely and appropriate detection, prevention and correction of releases of regulated substances from underground storage tanks (UST).

135.1(3) *Applicability.*

a. The requirements of this chapter apply to all owners and operators of a UST system as defined in 135.2(455B) except as otherwise provided in paragraphs *"b," "c,"* and *"d"* of this subrule. Any UST system listed in paragraph *"c"* of this subrule must meet the requirements of 135.1(4).

b. The following UST systems are excluded from the requirements of this chapter:

(1) Any UST system holding hazardous wastes listed or identified under Subtitle C of the Solid Waste Disposal Act, or a mixture of such hazardous waste and other regulated substances.

(2) Any wastewater treatment tank system that is part of a wastewater treatment facility regulated under Section 402 or 307(b) of the federal Clean Water Act.

(3) Equipment or machinery that contains regulated substances for operational purposes such as hydraulic lift tanks and electrical equipment tanks.

(4) Any UST system whose capacity is 110 gallons or less.

(5) Any UST system that contains a de minimus concentration of regulated substances.

(6) Any emergency spill or overflow containment UST system that is expeditiously emptied after use.

c. Deferrals. Rules 135.3(455B), 135.4(455B), 135.5(455B), 135.6(455B) and 135.9(455B) do not apply to any of the following types of UST systems:

(1) Wastewater treatment tank systems;

(2) Any UST systems containing radioactive material that are regulated under the federal Atomic Energy Act of 1954 (42 U.S.C. 2011 and following);

(3) Any UST system that is part of an emergency generator system at nuclear power generation facilities regulated by the Nuclear Regulatory Commission under 10 CFR 50 Appendix A;

(4) Airport hydrant fuel distribution systems; and

(5) UST systems with field-constructed tanks.

d. Deferrals. Rule 135.5(455B) does not apply to any UST system that stores fuel solely for use by emergency power generators. All new and replacement UST systems for emergency power generators must meet the secondary containment requirements in subrule 135.3(9) and the leak detection and delivery prohibition requirements in subrule 135.3(8).

e. Nonpetroleum underground storage tank systems. Rules 135.8(455B) to 135.12(455B) do not apply to any nonpetroleum underground storage tank system except as otherwise provided for by the department.

135.1(4) *Interim prohibition for deferred UST systems.*

a. No person may install a UST system listed in 135.1(3)*"c"* for the purpose of storing regulated substances unless the UST system (whether of single- or double-wall construction):

(1) Will prevent releases due to corrosion or structural failure for the operational life of the UST system;

(2) Is cathodically protected against corrosion, constructed of noncorrodible material, steel clad

with a noncorrodible material, or designed in a manner to prevent the release or threatened release of any stored substance; and

(3) Is constructed or lined with material that is compatible with the stored substance.

b. Notwithstanding paragraph *"a"* of this subrule, a UST system without corrosion protection may be installed at a site that is determined by a corrosion expert not to be corrosive enough to cause it to have a release due to corrosion during its operating life. Owners and operators must maintain records that demonstrate compliance with the requirements of this paragraph for the remaining life of the tank.

NOTE: The National Association of Corrosion Engineers Standard RP-02-85, "Control of External Corrosion on Metallic Buried, Partially Buried, or Submerged Liquid Storage Systems," may be used as guidance for complying with 135.1(4)*"b."*

567—135.2(455B) Definitions.

"Aboveground release" means any release to the surface of the land or to surface water. This includes, but is not limited to, releases from the aboveground portion of a UST system and aboveground releases associated with overfills and transfer operations as the regulated substance moves to or from a UST system.

"Active remediation" means corrective action undertaken to reduce contaminant concentrations by other than passive remediation or monitoring.

"Ancillary equipment" means any devices including, but not limited to, such devices as piping, fittings, flanges, valves, and pumps used to distribute, meter, or control the flow of regulated substances to and from a UST.

"Appurtenances" means devices such as piping, fittings, flanges, valves, dispensers and pumps used to distribute, meter, or control the flow of regulated substances to or from an underground storage tank.

"ASTM" means the American Society of Testing and Materials.

"*Asbestos-cement pipe*" means a pipe or conduit constructed of asbestos fiber, Portland cement, and water, which can be used to transport water.

"*Backflow preventer*" means a check valve used to make sure water flows in one direction, designed to prevent contamination from an end user, such as a home, from getting into the general water supply. An approved backflow preventer shall be a reduced pressure backflow preventer or an antisiphon device which complies with the standards of the American Water Works Association and has been approved by the Foundation for Cross-Connection Control and Hydraulic Research, University

"Bedrock" means the rock, usually solid, underlying soil or any other unconsolidated surficial cover.

"Below-ground release" means any release to the subsurface of the land and to groundwater. This includes, but is not limited to, releases from the below-ground portions of an underground storage tank system and below-ground releases associated with overfills and transfer operations as the regulated substance moves to or from an underground storage tank.

"Beneath the surface of the ground" means beneath the ground surface or otherwise covered with earthen materials.

"Best available technology" means those practices which most appropriately remove, treat, or isolate contaminants from groundwater, soil or associated environment, as determined through professional judgment considering actual equipment or techniques currently in use, published technical articles, site hydrogeology and research results, engineering and groundwater professional reference materials, consultation with experts in the field, capital and operating costs, and guidelines or rules of other regulatory agencies.

"Best management practices" means maintenance procedures, schedule of activities, prohibition of practices, and other management practices, or a combination thereof, which, after problem assessment, is determined to be the most effective means of monitoring and preventing additional

Comment [CR1]: I think we will need to compare with Water Supply definitions and agree on a reference source for those definitions not covered by existing Water Supply rules. We should also get review by Water Supply on these terms. I found these definitions from varies sources, but would prefer something more standardized.

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contamination of the groundwater and soil.

"Carcinogenic risk" means the incremental risk of a ~~p~~~~erson~~person developing cancer over a lifetime as a result of exposure to a chemical, expressed as a probability such as one in a million (10^{-6}). For carcinogenic chemicals of concern, probability is derived from application of certain designated exposure assumptions and a slope factor.

"*Cast iron pipe*" means a pipe or conduit used as a pressure pipe for transmission of water, gas, and sewage, and as a water drainage pipe. It comprises predominantly a gray cast iron tube and was frequently used uncoated, although later developments did result in various coating and linings to reduce corrosion and improve hydraulics.

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"Cathodic protection" is a technique to prevent corrosion of a metal surface by making that surface the cathode of an electrochemical cell. For example, a tank system can be cathodically protected through the application of either galvanic anodes or impressed current.

"Cathodic protection tester" means a person who can demonstrate an understanding of the principles and measurements of all common types of cathodic protection systems as applied to buried or submerged metal piping and tank systems. At a minimum, such persons must have education and experience in soil resistivity, stray current, structure-to-soil potential, and component electrical isolation measurements of buried metal piping and tank systems.

"CERCLA" means the Comprehensive Environmental Response, Compensation, and Liability Act of 1980.

"Certified groundwater professional" means a person certified pursuant to 1995 Iowa Code section 455G.18 and 567—Chapter 134.

"Change-in-service" means changing the use of a tank system from a regulated to a nonregulated use.

"Chemicals of concern" means the compounds derived from petroleum-regulated substances which are subject to evaluation for purposes of applying risk-based corrective action decision making. These compounds are benzene, ethylbenzene, toluene, and xylenes (BTEX) and naphthalene, benzo(a)pyrene, benz(a)anthracene, and chrysene. (NOTE: Measurement of these last four constituents may be done by a conversion method from total extractable hydrocarbons, see subrule 135.8(3).)

"Class A operator" means a person responsible for managing resources and personnel to achieve and maintain compliance with regulatory requirements under this chapter. This includes ensuring appropriate individuals are trained in the proper operation and maintenance of the underground storage tank system, the maintenance of all required records, the procedures for response to emergencies caused by releases or spills, and assuring financial responsibility and documentation to the department or its representatives as required.

"Class B operator" means a person who implements applicable underground storage tank regulatory requirements and standards. This includes implementing the day-to-day aspects of operating, maintaining, and record keeping for underground storage tanks at one or more facilities. A Class B operator typically monitors, maintains and ensures that release detection methods, record-keeping, and reporting requirements are met; release prevention equipment, record-keeping, and reporting requirements are met; all relevant equipment complies with performance standards; and appropriate individuals are trained to properly respond to emergencies caused by releases and spills.

"Class C operator" means an on-site employee who typically controls or monitors the dispensing or sale of regulated substances and who is the first line of response to events indicating emergency conditions.

"Compatible" means the ability of two or more substances to maintain their respective physical and chemical properties upon contact with one another for the design life of the tank system under conditions likely to be encountered in the UST.

"Conduit" means underground structures which act as pathways and receptors for chemicals of concern, including but not limited to gravity drain lines and sanitary or storm sewers.

"Connected piping" means all underground piping including valves, elbows, joints, flanges, and flexible connectors attached to a tank system through which regulated substances flow. For the

purpose of determining how much piping is connected to any individual UST system, the piping that joins two UST systems should be allocated equally between them.

"Consumptive use" with respect to heating oil means consumed on the premises.

"Corrective action" means an action taken to reduce, minimize, eliminate, clean up, control or monitor a release to protect the public health and safety or the environment. Corrective action includes, but is not limited to, excavation of an underground storage tank for the purpose of repairing a leak or removal of a tank, removal of contaminated soil, disposal or processing of contaminated soil, cleansing of groundwaters or surface waters, natural biodegradation, institutional controls, technological controls and site management practices. Corrective action does not include replacement of an underground storage tank. Corrective action specifically excludes third-party liability.

"Corrective action meeting process" means a series of meetings organized by department staff with owners or operators and other interested parties such as certified groundwater professionals, funding source representatives, and affected property owners. The purpose of the meeting process is to develop and agree on a corrective action plan and the terms for implementation of the plan.

"Corrective action plan" means a plan which specifies the corrective action to be undertaken by the owner or operator in order to comply with requirements in this chapter and which is incorporated into a memorandum of agreement or other written agreement between the department and the owner or operator. The plan may include but is not limited to provisions for additional site assessment, site monitoring, Tier 2 revisions, Tier 3 assessment, excavation, and other soil and groundwater remedial action.

"Corrosion expert" means a person who, by reason of thorough knowledge of the physical sciences and the principles of engineering and mathematics acquired by a professional education and related practical experience, is qualified to engage in the practice of corrosion control on buried or submerged metal piping systems and metal tanks. Such a person must be accredited or certified as being qualified by the National Association of Corrosion Engineers or be a registered professional engineer who has certification or licensing that includes education and experience in corrosion control of buried or submerged metal piping systems and metal tanks.

"Department" means Iowa department of natural resources.

"Dielectric material" means a material that does not conduct direct electrical current. Dielectric coatings are used to electrically isolate UST systems from the surrounding soils. Dielectric bushings are used to electrically isolate portions of the UST systems (e.g., tank from piping).

"Dispenser" means equipment that is used to transfer a regulated substance from underground piping through a rigid or flexible hose or piping located aboveground to a point of use outside the underground storage tank system, such as a motor vehicle.

"Drinking water well" means any groundwater well used as a source for drinking water by humans and groundwater wells used primarily for the final production of food or medicine for human consumption in facilities routinely characterized with the Standard Industrial Codes (SIC) group 283 for drugs and 20 for foods.

"*Ductile iron pipe*" means a pipe or conduit commonly used for potable water distribution and pumping of sewage. The predominant wall material is ductile iron, a spheroidized graphite cast iron, commonly with an internal cement mortar lining to inhibit corrosion from the carried water and various types of external coating are used to inhibit corrosion from the environment.

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"Electrical equipment" means underground equipment that contains dielectric fluid that is necessary for the operation of equipment such as transformers and buried electrical cable.

"Enclosed space" means space which can act as a receptor or pathway capable of creating a risk of explosion or inhalation hazard to humans and includes "explosive receptors" and "confined spaces." Explosive receptors means those receptors designated in these rules which are evaluated for explosive risk. Confined spaces means those receptors designated in these rules for evaluation of vapor inhalation risks.

"Excavation zone" means the volume containing the tank system and backfill material bounded by the ground surface, walls, and floor of the pit and trenches into which the UST system is placed at

the time of installation.

"Existing tank system" means a tank system used to contain an accumulation of regulated substances or for which installation has commenced on or before January 14, 1987. Installation is considered to have commenced if:

The owner or operator has obtained all federal, state, and local approvals or permits necessary to begin physical construction of the site or installation of the tank system; and if,

1. Either a continuous on-site physical construction or installation program has begun; or,
2. The owner or operator has entered into contractual obligations, which cannot be canceled or modified without substantial loss, for physical construction at the site or installation of the tank system to be completed within a reasonable time.

"Farm tank" is a tank located on a tract of land devoted to the production of crops or raising animals, including fish, and associated residences and improvements. A farm tank must be located on the farm property. "Farm" includes fish hatcheries, rangeland and nurseries with growing operations.

"Flow-through process tank" is a tank that forms an integral part of a production process through which there is a steady, variable, recurring, or intermittent flow of materials during the operation of the process. Flow-through process tanks do not include tanks used for the storage of materials prior to their introduction into the production process or for the storage of finished products or by-products from the production process.

"Free product" refers to a regulated substance that is present as a nonaqueous phase liquid (e.g., liquid not dissolved in water).

"*Gasket*" means any types of pipe seals made of a variety of rubbers including but not necessarily limited to styrene-butadiene rubber (SBR), nitrile-butadiene rubber (NBR or nitrile), ethylene propylene diene monomer (EPDM), neoprene (CR), and fluoroelastomer rubber (FKM), which are used to seal pipe connections.

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"Gathering lines" means any pipeline, equipment, facility, or building used in the transportation of oil or gas during oil or gas production or gathering operations.

"Groundwater ingestion pathway" means a pathway through groundwater by which chemicals of concern may result in exposure to a human receptor as specified in rules applicable to Tier 1, Tier 2 and Tier 3.

"Groundwater plume" means the extent of groundwater impacted by the release of chemicals of concern.

"Groundwater to ~~plastic~~ water line pathway" means a pathway through groundwater which leads to a ~~plastic~~ water line.

"Groundwater vapor to enclosed space pathway" means a pathway through groundwater by which vapors from chemicals of concern may lead to a receptor creating an inhalation or explosive risk hazard.

"Hazardous substance UST system" means an underground storage tank system that contains a hazardous substance defined in Section 101(14) of the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (but not including any substance regulated as a hazardous waste under subtitle C) or any mixture of such substances and petroleum, and which is not a petroleum UST system.

"Hazard quotient" means the ratio of the level of exposure of a chemical of concern over a specified time period to a reference dose for that chemical of concern derived for a similar exposure period. Unless otherwise specified, the hazard quotient designated in these rules is one.

"Heating oil" means petroleum that is No. 1, No. 2, No. 4-light, No. 4-heavy, No. 5-light, No. 5-heavy, and No. 6 technical grades of fuel oil; other residual fuel oils (including Navy Special Fuel Oil and Bunker C); and other fuels when used as substitutes for one of these fuel oils. Heating oil is typically used in the operation of heating equipment, boilers, or furnaces.

"Highly permeable soils" means for the purpose of UST closures: fractured bedrock, any soils with a hydraulic conductivity rate greater than 0.3 meters per day, or any soil material classified by the Unified Soil Classification System as published by the United States Department of the Interior or

ASTM designation as (1) GW - well graded gravel, gravel-sand mixtures, little or no fines, (2) GP - poorly graded gravel, gravel-sand mixtures, little or no fines, (3) SW - well graded sands, gravelly sands, little or no fines, or (4) SP - poorly graded sands, gravelly sands, little or no fines.

"Hydraulic conductivity" means the rate of water movement through the soil measured in meters per day (m/d) as determined by the following methods. For a saturated soil, the Bouwer-Rice method or its equivalent shall be used. For unsaturated soil, use a Guelph permeameter or an equivalent in situ constant-head permeameter in a boring finished above the water table. If an in situ method cannot be used for unsaturated soil because of depth, or if the soil is homogeneous and lacks flow-conducting channels, fractures, cavities, etc., laboratory measurement of hydraulic conductivity is acceptable.

If laboratory methods are used, collect undisturbed soil samples using a thin-walled tube sampler in accordance with American Society of Testing and Materials (ASTM) Standard D1587. Samples shall be clearly marked, preserved and transported to the laboratory. The laboratory shall measure hydraulic conductivity using a constant-head permeameter in accordance with ASTM Standard D2434 or a falling-head permeameter in accordance with accepted methodology.

"Hydraulic lift tank" means a tank holding hydraulic fluid for a closed-loop mechanical system that uses compressed air or hydraulic fluid to operate lifts, elevators, and other similar devices.

"Institutional controls" means the restriction on use or access (for example, fences, deed restrictions, restrictive zoning) to a site or facility to eliminate or minimize potential exposure to a chemical(s) of concern. Institutional controls include any of the following:

1. A law of the United States or the state;
2. A regulation issued pursuant to federal or state laws;
3. An ordinance or regulation of a political subdivision in which real estate subject to the institutional control is located;
4. A restriction on the use of or activities occurring at real estate which are embodied in a covenant running with the land which:

- Contains a legal description of the real estate in a manner which satisfies Iowa Code section 558.1 et seq.;
- Is properly executed, in a manner which satisfies Iowa Code section 558.1 et seq.;
- Is recorded in the appropriate office of the county in which the real estate is located;
- Adequately and accurately describes the institutional control; and
- Is in the form of a covenant as set out in Appendix C or in such a manner reasonably acceptable to the department.

5. Any other institutional control the owner or operator can reasonably demonstrate to the department which will reduce the risk from a release throughout the period necessary to ensure that no applicable target risk is likely to be exceeded.

"Liquid trap" means sumps, well cellars, and other traps used in association with oil and gas production, gathering, and extraction operations (including gas production plants), for the purpose of collecting oil, water, and other liquids. These liquid traps may temporarily collect liquids for subsequent disposition or reinjection into a production or pipeline stream, or may collect and separate liquids from a gas stream.

"Maintenance" means the normal operational upkeep to prevent an underground storage tank system from releasing product.

"MCLs" means the drinking water primary maximum contaminant levels set out in 567—41.3(455B).

"Memorandum of agreement" means a written agreement between the department and the owner or operator which specifies the corrective action that will be undertaken by the owner or operator in order to comply with requirements in this chapter and the terms for implementation of the plan. The plan may include but is not limited to provisions for additional site assessment, site monitoring, Tier 2 revisions, Tier 3 assessment, excavation, and other soil and groundwater remedial action.

"Motor fuel" means petroleum or a petroleum-based substance that is motor gasoline, aviation gasoline, No. 1 or No. 2 diesel fuel, or any grade of gasohol, and is typically used in the operation

of a motor engine.

"New tank system" means a tank system that will be used to contain an accumulation of regulated substances and for which installation has commenced after January 14, 1987. (See also "Existing Tank System.")

"Noncarcinogenic risk" means the potential for adverse systemic or toxic effects caused by exposure to noncarcinogenic chemicals of concern, expressed as the hazard quotient.

"Noncommercial purposes" with respect to motor fuel means not for resale.

"Non-drinking water well" means any groundwater well (except an extraction well used as part of a remediation system) not defined as a drinking water well including a groundwater well which is not properly plugged in accordance with department rules in 567—Chapters 39 and 49.

"Nonresidential area" means land which is not currently used as a residential area and which is zoned for nonresidential uses.

"On the premises where stored" with respect to heating oil means UST systems located on the same property where the stored heating oil is used.

"Operational life" refers to the period beginning when installation of the tank system has commenced until the time the tank system is properly closed under rule 135.15(455B).

"Operator" means any person in control of, or having responsibility for, the daily operation of the UST system.

"Overfill release" is a release that occurs when a tank is filled beyond its capacity, resulting in a discharge of the regulated substance to the environment.

"Owner" means:

1. In the case of a UST system in use on July 1, 1985, or brought into use after that date, any person who owns a UST system used for storage, use, or dispensing of regulated substances; and
2. In the case of any UST system in use before July 1, 1985, but no longer in use on that date, any person who owned such UST immediately before the discontinuation of its use.

"Owner" does not include a person, who, without participating in the management or operation of the underground storage tank or the tank site, holds indicia of ownership primarily to protect that person's security interest in the underground storage tank or the tank site property, prior to obtaining ownership or control through debt enforcement, debt settlement, or otherwise.

"Pathway" means a transport mechanism by which chemicals of concern may reach a receptor(s) or the location(s) of a potential receptor.

"Permanent closure" means removing all regulated substances from the tank system, assessing the site for contamination, and permanently removing tank and piping from the ground or filling the tank in place with a solid inert material and plugging all piping. Permanent closure also includes partial closure of a tank system such as removal or replacement of tanks or piping only.

"Person" means an individual, trust, firm, joint stock company, federal agency, corporation, state, municipality, commission, political subdivision of a state, or any interstate body. "Person" also includes a consortium, a joint venture, a commercial entity, and the United States government.

"Person who conveys or deposits a regulated substance" means a person who sells or supplies the owner or operator with the regulated substance and the person who transports or actually deposits the regulated substance in the underground tank.

"Petroleum UST system" means an underground storage tank system that contains petroleum or a mixture of petroleum with de minimus quantities of other regulated substances. Such systems include those containing motor fuels, jet fuels, distillate fuel oils, residual fuel oils, lubricants, petroleum solvents, and used oils.

"Pipe" or *"piping"* means a hollow cylinder or tubular conduit that is constructed of nonearthen materials and that routinely contains and conveys regulated substances from the underground tank(s) to the dispenser(s) or other end-use equipment. Such piping includes any elbows, couplings, unions, valves, or other in-line fixtures that contain and convey regulated substances from the underground tank(s) to the dispenser(s). This definition does not include vent, vapor recovery, or fill lines.

"Pipeline facilities (including gathering lines)" are new and existing pipe rights-of-way and any

associated equipment, facilities, or buildings.

"Point of compliance" means the location(s) at the source(s) of contamination or at the location(s) between the source(s) and the point(s) of exposure where concentrations of chemicals of concern must meet applicable risk-based screening levels at Tier 1 or other target level(s) at Tier 2 or Tier 3.

"Point of exposure" means the location(s) at which an actual or potential receptor may be exposed to chemicals of concern via a pathway.

"*Polybutylene pipe*" means a water supply pipe comprised of form of plastic resin that was used extensively from 1978 until 1995. The piping systems were used for underground water mains and as interior water distribution piping. Polybutylene mains are usually blue in color, but may be gray or black. Polybutylene service lines are may be gray, black, or white in color. The pipe is usually 1/2" or 1" in diameter, and it may be found entering a residence through the basement wall or floor, concrete slab or coming up through the crawlspace; frequently it enters the residence near the water heater. A main shutoff valve is attached to the end of the water main. It may be necessary to check at the water meter that is located at the street, near the city water main. It is recommended to check at both ends of the water line pipe because there have been cases where copper pipe enters the home, and poly pipe is at the water meter. Both pipes could have been used and connected somewhere underground.

"*Polyethylene pipe*" means a water supply pipe comprised of thermoplastic material produced from the polymerization of ethylene. PE plastic pipe is manufactured by extrusion in sizes ranging from ½" to 63". PE is available in rolled coils of various lengths or in straight lengths up to 40 feet. PE pipe is available in many forms and colors including single extrusion colored or black pipe, black pipe with co-extruded color striping, and black or natural pipe with a co-extruded colored layer. PE pipe has been demonstrated to be very permeable to petroleum while still retaining its flexible structure.

"*Polyvinyl chloride pipe*" means a pipe made from a plastic and vinyl combination material. The pipes are durable, hard to damage, and long lasting. A PVC pipe is very resistant and does not rust, nor is it likely to rot or wear over time. PVC piping is most commonly used in water systems, underground wiring, and sewer lines.

"*Portland cement*" means hydraulic cement (cement that not only hardens by reacting with water but also forms a water-resistant product) and is produced by pulverizing clinkers consisting essentially of hydraulic calcium silicates, usually containing one or more forms of calcium sulfate as an inter ground addition.

"Potential receptor" means a receptor not in existence at the time a Tier 1, Tier 2 or Tier 3 site assessment is prepared, but which could reasonably be expected to exist within 20 years of the preparation of the Tier 1, Tier 2 or Tier 3 site assessment or as otherwise specified in these rules.

"Preferential pathway" means conditions which act as a pathway permitting contamination to migrate through soils and to groundwater at a faster rate than would be expected through naturally occurring undisturbed soils or unfractured bedrock including but not limited to wells, cisterns, tile lines, drainage systems, utility lines and envelopes, and conduits.

"Protected groundwater source" means a saturated bed, formation, or group of formations which has a hydraulic conductivity of at least 0.44 meters per day (m/d) and a total dissolved solids of less than 2,500 milligrams per liter (mg/l) or a bedrock aquifer with total dissolved solids of less than 2,500 milligrams per liter (mg/l) if bedrock is encountered before groundwater.

"Public water supply well" means a well connected to a system for the provision to the public of piped water for human consumption, if such system has at least 15 service connections or regularly serves an average of at least 25 individuals daily at least 60 days out of the year.

"Receptor" means enclosed spaces, conduits, protected groundwater sources, drinking and non-drinking water wells, surface water bodies, and public water systems which when impacted by chemicals of concern may result in exposure to humans and aquatic life, explosive conditions or other adverse effects on health, safety and the environment as specified in these rules.

"Reference dose" means a designated toxicity value established in these rules for evaluating potential noncarcinogenic effects in humans resulting from exposure to a chemical(s) of concern.

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Reference doses are designated in Appendix A.

"Regulated substance" means an element, compound, mixture, solution or substance which, when released into the environment, may present substantial danger to the public health or welfare or the environment. Regulated substance includes:

1. Substances designated in Table 302.4 of 40 CFR Part 302 (September 13, 1988),
2. Substances which exhibit the characteristics identified in 40 CFR 261.20 through 261.24 (May 10, 1984) and which are not excluded from regulation as a hazardous waste under 40 CFR 261.4(b) (May 10, 1984),
3. Any substance defined in Section 101(14) of the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) of 1980 (but not including any substance regulated as a hazardous waste under subtitle C), and
4. Petroleum, including crude oil or any fraction thereof that is liquid at standard conditions of temperature and pressure (60 degrees Fahrenheit and 14.7 pounds per square inch absolute). The term "regulated substance" includes but is not limited to petroleum and petroleum-based substances comprised of a complex blend of hydrocarbons derived from crude oil through processes of separation, conversion, upgrading, and finishing, such as motor fuels, jet fuels, distillate fuel oils, residual fuel oils, lubricants, petroleum solvents, and used oils.

"Release" means any spilling, leaking, emitting, discharging, escaping, leaching or disposing of a regulated substance, including petroleum, from a UST into groundwater, surface water or subsurface soils.

"Release detection" means determining whether a release of a regulated substance has occurred from the UST system into the environment or into the interstitial space between the UST system and its secondary barrier or secondary containment around it.

"Repair" means to restore a tank or UST system component that has caused a release of product from the UST system.

"Replace" or *"replacement"* means the installation of a new underground tank system or component, including dispensers, in substantially the same location as an existing tank system or component in lieu of that tank system or component.

"Residential area" means land used as a permanent residence or domicile, such as a house, apartment, nursing home, school, child care facility or prison, land zoned for such uses, or land where no zoning is in place.

"Residential tank" is a tank located on property used primarily for dwelling purposes.

"Risk-based screening level (RBSL)" means the risk-based concentration level for chemicals of concern developed for a Tier 1 analysis to be met at the point(s) of compliance and incorporated in the Tier 1 Look-up Table in Appendix A.

"SARA" means the federal Superfund Amendments and Reauthorization Act of 1986.

"Secondary containment tank" or *"secondary containment piping"* means a tank or piping which is designed with an inner primary shell and a liquid-tight outer secondary shell or jacket which extends around the entire inner shell, and which is designed to contain any leak through the primary shell from any part of the tank or piping that routinely contains product, and which also allows for monitoring of the interstitial space between the shells and the detection of any leak.

"*Semi-volatile compounds*" means a semi-volatile organic compound (SVOC) that is one of two major classes of organic compounds which include: pesticides, PCBs, polynuclear aromatics, plasticizers, wood preservatives, and other pollutants. These compounds may be found deposited on or mixed in with vegetation, soil, or water. They might even be found as abandoned hazardous waste mixed in with other man-made chemicals. Semi-volatiles could encompass thousands of organic chemicals. The basis of the SVOC class is the fact that they are not as easily gaseous at room temperature (as are the volatiles).

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"Septic tank" is a watertight covered receptacle designed to receive or process, through liquid separation or biological digestion, the sewage discharged from a building sewer. The effluent from such receptacle is distributed for disposal through the soil and settled solids and scum from the tank

are pumped out periodically and hauled to a treatment facility.

"*Service line*" means a pipe connected to a business or residence from~~to and feeding off of~~ a water main, typically of a size not exceeding ~~6~~six inches in diameter, and including its gaskets and other appurtenances. For purposes of this rule, service lines refer to pipes specifically for drinking water transmission.

"Site assessment investigation" means an investigation conducted by a registered groundwater professional to determine relevant site historical data, the types, amounts, and sources of petroleum contaminants present, hydrogeological characteristics of the site, full vertical and horizontal extent of the contamination in soils and groundwater, direction and rate of flow of the contamination, ranges of concentration of the contaminants by analysis of soils and groundwater, the vertical and horizontal extent of the contamination exceeding department standards, and the actual or potential threat to public health and safety and the environment.

"Site cleanup report" means the report required to be submitted by these rules and in accordance with department guidance which may include the results of Tier 2 or Tier 3 assessment and analysis.

"Site-specific target level (SSTL)" means the risk-based target level(s) for chemicals of concern developed as the result of a Tier 2 or Tier 3 assessment which must be achieved at applicable point(s) of compliance at the source to meet the target level(s) at the point(s) of exposure.

"Soil leaching to groundwater pathway" means a pathway through soil by which chemicals of concern may leach to groundwater and through a groundwater transport pathway impact an actual or potential receptor.

"Soil plume" means the vertical and horizontal extent of soil impacted by the release of chemicals of concern.

"Soil to ~~plastic~~ water line pathway" means a pathway which leads from soil to a ~~plastic~~ water line.

"Soil vapor to enclosed space pathway" means a pathway through soil by which vapors from chemicals of concern may lead to a receptor creating an inhalation or explosive risk hazard.

"Storm water or wastewater collection system" means piping, pumps, conduits, and any other equipment necessary to collect and transport the flow of surface water run-off resulting from precipitation, or domestic, commercial, or industrial wastewater to and from retention areas or any areas where treatment is designated to occur. The collection of storm water and wastewater does not include treatment except where incidental to conveyance.

"Surface impoundment" is a natural topographic depression, constructed excavation, or diked area formed primarily of earthen materials (although it may be lined with manufactured materials) that is not an injection well.

"Surface water body" means general use segments as provided in 567—paragraph 61.3(1)*"a"* and designated use segments of water bodies as provided in 567—paragraph 61.3(1)*"b"* and 567—subrule 61.3(5).

"Surface water criteria" means, for chemicals of concern, the Criteria for Chemical Constituents in Table 1 of rule 567—61.3(455B), except that "1,000 ug/L" will be substituted for the chronic levels for toluene for Class B designated use segments.

"Surface water pathway" means a pathway which leads to a surface water body.

"*Synergistic effects*" means the effect of two or more chemicals on a material shown to be greater than the effect of each chemical individually, or the sum of the individual effects, or the presence of one chemical enhances the effects of the second. This is called a synergistic effect, or synergy, and the chemicals are sometimes described as showing synergism.

"Tank" is a stationary device designed to contain an accumulation of regulated substances and constructed of nonearthen materials (e.g., concrete, steel, plastic) that provide structural support.

"Target level" means the allowable concentrations of chemicals of concern established to achieve an applicable target risk which must be met at the point(s) of compliance as specified in these rules.

"Target risk" refers to an applicable carcinogenic and noncarcinogenic risk factor designated in these rules and used in determining target levels (for carcinogenic risk assessment, target risk is a

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separate factor, different from exposure factors, both of which are used in determining target levels).

"Technological controls" means a physical action which does not involve source removal or reduction, but severs or reduces exposure to a receptor, such as caps, containment, carbon filters, point of use water treatment, etc.

"Tier 1 level" means the groundwater and soil levels in the Tier 1 Look-up Table set out in rule 135.9(455B) and Appendix A.

"Tier 1 site assessment" means the evaluation of limited site-specific data compared to the Tier 1 levels established in these rules for the purpose of determining which pathways do not require assessment and evaluation at Tier 2 and which sites warrant a no further action required classification without further assessment and evaluation.

"Tier 2 site assessment" means the process of assessing risk to actual and potential receptors by using site-specific field data and designated Tier 2 exposure and fate and transport models to determine the applicable target level(s).

"Tier 3 site assessment" means a site-specific risk assessment utilizing more sophisticated data or analytic techniques than a Tier 2 site assessment.

"Under-dispenser containment (UDC)" means containment underneath a dispenser that will prevent leaks from the dispenser from reaching soil or groundwater. Such containment must:

- Be intact and liquid-tight on its sides and bottom and at any penetrations;
- Be compatible with the substance conveyed by the piping; and
- Allow for visual inspection and monitoring and access to the components in the containment system.

"Underground area" means an underground room, such as a basement, cellar, shaft or vault, providing enough space for physical inspection of the exterior of the tank situated on or above the surface of the floor.

"Underground release" means any below-ground release.

"Underground storage tank" or *"UST"* means any one or combination of tanks (including underground pipes connected thereto) that is used to contain an accumulation of regulated substances, and the volume of which (including the volume of underground pipes connected thereto) is 10 percent or more beneath the surface of the ground. This term does not include any:

a. Farm or residential tank of 1100 gallons or less capacity used for storing motor fuel for noncommercial purposes. Iowa Code section 455B.471 requires those tanks existing prior to July 1, 1987, to be registered. Tanks installed on or after July 1, 1987, must comply with all 567—Chapter 135 rules;

b. Tank used for storing heating oil for consumptive use on the premises where stored;

c. Septic tank;

d. Pipeline facility (including gathering lines) regulated under:

(1) The Natural Gas Pipeline Safety Act of 1968 (49 U.S.C. App. 1671, et seq.), or

(2) The Hazardous Liquid Pipeline Safety Act of 1979 (49 U.S.C. App. 2001, et seq.), or

(3) Which is an intrastate pipeline facility regulated under state laws comparable to the provisions of the law referred to in *"d"*(1) or *"d"*(2) of this definition;

e. Surface impoundment, pit, pond, or lagoon;

f. Storm-water or wastewater collection system;

g. Flow-through process tank;

h. Liquid trap or associated gathering lines directly related to oil or gas production and gathering operations; or

i. Storage tank situated in an underground area (such as a basement, cellar, mineworking, drift, shaft, or tunnel) if the storage tank is situated upon or above the surface of the floor.

The term "underground storage tank" or "UST" does not include any pipes connected to any tank which is described in paragraphs *"a"* through *"j"* of this definition.

"Underground utility vault" means any constructed space accessible for inspection and maintenance associated with subsurface utilities.

"Unreasonable risk to public health and safety or the environment" means the Tier 1 levels for a Tier 1 site assessment, the applicable target level for a Tier 2 site assessment, and the applicable target level for a Tier 3 site assessment.

"Upgrade" means the addition or retrofit of some systems such as cathodic protection, lining, or spill and overfill controls to improve the ability of an underground storage tank system to prevent the release of product.

"UST system" or *"tank system"* means an underground storage tank, connected underground piping, underground ancillary equipment, and containment system, if any.

"Utility envelope" means the backfill and trench used for any subsurface utility line, drainage system and tile line.

"*Volatile compounds*" means compounds that have a high vapor pressure and low water solubility that are often ~~human-made~~ synthetic? chemicals used often as components of petroleum fuels, hydraulic fluids, paint thinners, and dry cleaning agents and also produced in the manufacture of paints, pharmaceuticals, and refrigerants.

"Wastewater treatment tank" means a tank that is designed to receive and treat an influent wastewater through physical, chemical, or biological methods.

"*Water line*" means a hollow cylinder or tubular conduit that is constructed of nonearthen materials including but not limited to asbestos-cement, copper, HDPE, polybutylene, polyethylene, and wood that routinely contains and conveys potable water. Such piping includes any elbows, couplings, unions, valves, or other in-line fixtures, as well as the gaskets, which contain and convey potable water.

"*Water main pipe*" means a main line to the water distribution system with feeder lines or service lines ~~coming~~ connected to ~~off of~~ it and which typically is of ~~6~~six inches or greater in diameter, and including its gaskets and other appurtenances.

[**ARC 7621B**, IAB 3/11/09, effective 4/15/09; **ARC 8124B**, IAB 9/9/09, effective 10/14/09]

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567—135.8(455B) Risk-based corrective action.

135.8(1) *General.* The objective of risk-based corrective action is to effectively evaluate the risks posed by contamination to human health, safety and the environment using a progressively more site-specific, three-tiered approach to site assessment and data analysis. Based on the tiered assessment, a corrective action response is determined sufficient to remove or minimize risks to acceptable levels. Corrective action response includes a broad range of options including reduction of contaminant concentrations through active or passive methods, monitoring of contamination, use of technological controls or institutional controls.

a. Tier 1. The purpose of a Tier 1 assessment is to identify sites which do not pose an unreasonable risk to public health and safety or the environment based on limited site data. The objective is to determine maximum concentrations of chemicals of concern at the source of a release(s) in soil and groundwater. The Tier 1 assessment assumes worst-case scenarios in which actual or potential receptors could be exposed to these chemicals at maximum concentrations through certain soil and groundwater pathways. The point of exposure is assumed to be the source showing maximum concentrations. Risk-based screening levels (Tier 1 levels) contained in the Tier 1 Look-Up Table have been derived from models which use conservative assumptions to predict exposure to actual and potential receptors. (These models and default assumptions are contained in Appendix A.) If Tier 1 levels are not exceeded for a pathway, that pathway may not require further assessment. If the maximum concentrations exceed a Tier 1 level, the options are to conduct a more extensive Tier 2 assessment, apply an institutional control, or in limited circumstances excavate contaminated soil to below Tier 1 levels. If all pathways clear the Tier 1 levels, it is possible for the site to obtain a no action required classification.

b. Tier 2. The purpose of a Tier 2 assessment is to use site-specific data to assess the risk from chemicals of concern to existing receptors and potential receptors using fate and transport models in

accordance with 135.10(455B). See 135.10(2)*"a."*

c. Tier 3. Where site conditions may not be adequately addressed by Tier 2 procedures, a Tier 3 assessment may provide more accurate risk assessment. The purpose of Tier 3 is to identify reasonable exposure levels of chemicals of concern and to assess the risk of exposure to existing and potential receptors based on additional site assessment information, probabilistic evaluations, or sophisticated chemical fate and transport models in accordance with 135.11(455B).

d. Notification. Whenever the department requires a tiered site assessment and a public water supply well is within 2,500 feet of a leaking underground storage tank site, the department will notify the public water supply operator.

e. Pathway reevaluation. Prior to issuance of a no further action certificate in accordance with 135.12(10) and Iowa Code section 455B.474(1)*"h"*(3), if it is determined that the conditions for an individual pathway that has been classified as "no action required" no longer exist, or the site presents an unreasonable risk to a public water supply well and the model used to obtain the pathway clearance underpredicts the actual contaminant plume, the individual pathway shall be further assessed consistent with the risk-based corrective action provisions in rules 567—135.8(455B) through 567—135.12(455B).

135.8(2) *Certified groundwater professional.* All assessment, corrective action, data analysis and report development required under rules 135.6(455B) to 135.12(455B) must be conducted by or under the supervision of a certified groundwater professional in accordance with these rules and department guidance as specified.

135.8(3) *Chemicals of concern.* Soil and groundwater samples from releases of petroleum regulated substances must always be analyzed for the presence of benzene, ethylbenzene, toluene, and xylenes. In addition, if the release is suspected to include any petroleum regulated substance other than gasoline or gasoline blends, or if the source of the release is unknown, the samples must be tested for the presence of Total Extractable Hydrocarbons (TEH). Appendices A and B and department Tier 2 guidance define a method for converting TEH values to a default concentration for naphthalene, benzo(a)pyrene, benz(a)anthracene and chrysene and conversion back to a representative TEH value. These default values must be used in order to apply Tier 2 modeling to these constituents in the absence of accurate laboratory analysis. At Tier 2 and Tier 3, owners and operators have the option of analyzing for these specific constituents and applying them to the specific target levels in Appendices A and B instead of using the TEH conversion method if an approved laboratory and laboratory technique are used. If a water line is located in an area of potential mixed contamination with petroleum and other chemicals such as pesticides and dry cleaning solvents, initial samples must be analyzed for volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), or other applicable compound(s) ~~if relevant research indicates the potential~~ to evaluate for the potential of synergistic effects of chemical mixing.

135.8(4) *Boring depth for sampling.* When drilling for the placement of groundwater monitoring wells, if groundwater is encountered, drilling must continue to the maximum of 10 feet below the first encountered groundwater or to the bottom of soil contamination as estimated by field screening. If groundwater is not encountered, drilling must continue to the deeper of 10 feet below the soil contamination as estimated by field screening or 75 feet from the ground surface.

135.8(5) *Bedrock aquifer assessment.* Prior to conducting any groundwater drilling, a groundwater professional must determine if there is a potential to encounter bedrock before groundwater. These potential areas include (1) areas where karst features or outcrops exist in the vicinity and (2) areas with bedrock less than 50 feet from the surface as illustrated in Tier 1 and Tier 2 guidance. The purpose of this determination is to prevent drilling through contaminated subsurface areas thereby creating a preferential pathway to a bedrock aquifer. If the first encountered groundwater is above bedrock but near the bedrock surface or fluctuates above and below bedrock, the groundwater professional should evaluate the subsurface geology and aquifer characteristics to determine the potential for creating a preferential pathway. If it is determined that the aquifer acts like a nongranular aquifer as provided in 135.10(3)*"a"* or bedrock is encountered before groundwater, the groundwater

professional must conduct a Tier 2 assessment for all pathways under 135.10(455B), including the specified bedrock procedures under 135.10(3).

If the first encountered groundwater is above bedrock with sufficient separation and aquifer characteristics to establish that it acts as a granular aquifer, site assessment may proceed under the site check procedure in 135.6(455B), the Tier 1 procedure in 135.9(455B) or the Tier 2 procedure in 135.10(455B) as would be customary regardless of the bedrock designation. However, even under this condition, drilling through bedrock should be avoided in contaminated areas.

[**ARC 7621B**, IAB 3/11/09, effective 4/15/09]

567—135.9(455B) Tier 1 site assessment policy and procedure.

135.9(1) *General.* The main objective of a Tier 1 site assessment is to reasonably determine the highest concentrations of chemicals of concern which would be associated with any suspected or confirmed release and an accurate identification of applicable receptors. In addition, the placement and depth of borings and the construction of monitoring wells must be sufficient to determine the sources of all releases, the vertical extent of contamination, an accurate description of site stratigraphy, and a reliable determination of groundwater flow direction.

a. Pathway assessment. The pathways to be evaluated at Tier 1 are the groundwater ingestion pathway, soil leaching to groundwater pathway, groundwater vapor to enclosed space pathway, soil vapor to enclosed space pathway, soil to ~~plastic~~ water line pathway, groundwater to ~~plastic~~ water line pathway and the surface water pathway. Assessment requires a determination of whether a pathway is complete, an evaluation of actual and potential receptors, a determination of whether conditions are satisfied for obtaining no further action clearance for individual pathways, or for obtaining a complete site classification of "no action required." A pathway is considered complete if a chemical of concern has a route which could be followed to reach an actual or potential receptor.

b. Pathway clearance. If field data for an individual pathway does not exceed the applicable Tier 1 levels or if a pathway is incomplete, no further action is required to evaluate the pathway unless otherwise specified in these rules. If the field data for a pathway exceeds the applicable Tier 1 level(s) in the "Iowa Tier 1 Look-up Table," the response is to conduct further assessment under Tier 2 or Tier 3 unless an effective institutional control is approved. In limited circumstances excavation of contaminated soils may be used as an option to obtain pathway clearance. If further site assessment indicates site data exceeds an applicable Tier 1 level(s) for a previously cleared pathway or the conditions justifying a determination of pathway incompleteness change, that pathway must be reevaluated as part of a Tier 2 or Tier 3 assessment.

c. Chemical group clearance. If field data for all chemicals of concern within a designated group of chemicals is below the Tier 1 levels, no further action is required as to the group of chemicals unless otherwise specified in these rules. Group one consists of benzene, ethylbenzene, toluene, and xylenes (BTEX). Group two consists of naphthalene, benzo(a)pyrene, benz(a)anthracene and chrysene; TEH default values are incorporated into the Iowa Tier 1 Look-Up Table and Appendix A for group two chemicals.

d. Site classification. A site can be classified as no action required only after all pathways have met the conditions for pathway clearance as provided in this rule.

e. Groundwater sampling procedure. Groundwater sampling and field screening must be conducted in accordance with department Tier 1 guidance. A minimum of three properly constructed groundwater monitoring wells must be installed, subject to the limitations on maximum drilling depths, for the purpose of identifying maximum concentrations of groundwater contamination, suspected sources of releases, and groundwater flow direction.

(1) Field screening must be used to locate suspected releases and to determine locations with the greatest concentrations of contamination. Field screening is required as per department guidance at each former and current tank basin, each former and current pump island, along the piping, and at any other areas of actual or suspected releases. In placing monitoring wells, the following must be considered: field screening data, available current and historical information regarding the releases,

tank and piping layout, site conditions, and drilling data available from sites in the vicinity. At least one well must be placed at each suspected source of release which shall include at a minimum: the pump island with the greatest field screening level, each current and former underground storage tank basin, and if field screening shows greater levels than at the pump islands or tank basins, at other suspected sources of releases. As a general rule, wells should be installed outside of the tank basin through native soils but as close to the tank basin as feasible. A well must be installed in a presumed downgradient direction and within 30 feet of the sample with the greatest field screening level. Three of the wells must be placed in a triangular arrangement to determine groundwater flow direction.

(2) Where the circumstances which prompt a Tier 1 assessment identify a discrete source and cause of a release, and the groundwater professional is able to rule out other suspected sources or contributing sources such as pump islands, piping runs and tank basins, the application of field screening and groundwater well placement may be limited to the known source.

f. Soil sampling procedure. The objective of soil sampling is to identify the maximum concentrations of soil contamination in the vadose and saturated zones and to identify sources of releases. The same principles stated above apply to soil sampling. Soil samples must be taken from borings with the greatest field screening levels even if the boring will not be converted to a monitoring well. At a minimum, soil and groundwater samples must be collected for analysis from all borings which are converted to monitoring wells.

Iowa Tier 1 Look-Up Table

Media	Exposure Pathway	Receptor	Group 1				Group 2: TEH	
			Benzene	Toluene	Ethylbenzene	Xylenes	Diesel*	Waste Oil
Groundwater (µg/L)	Groundwater Ingestion	Actual	5	1,000	700	10,000	1,200	400
		Potential	290	7,300	3,700	73,000	75,000	40,000
	Groundwater Vapor to Enclosed Space	All	1,540	20,190	46,000	NA	2,200,000	NA
	Groundwater to Water Line	Mains	7,500	6,250	22,950	71,250	75,000	40,000
		Service Lines	3,750	3,125	11,475	35,625	75,000	40,000
		PE/PB/AC	200	3,125	3,400	19,000	75,000	40,000
	Surface Water	All	290	1,000	3,700	73,000	75,000	40,000
Soil	Soil Leaching to Groundwater	All	0.54	42	15	NA	3,800	NA
	Soil Vapor to Enclosed Space	All	1.16	48	79	NA	47,500	NA
	Soil to Water Line	All	2.0	3.25	26	79	10,500	NA

~~Media~~	~~Exposure Pathway~~	~~Receptor~~	~~Group 1~~				~~Group 2: TEH~~	
			~~Benzene~~	~~Toluene~~	~~Ethylbenzene~~	~~Xylenes~~	~~Diesel*~~	~~Waste Oil~~
~~Groundwater (ug/L)~~	~~Groundwater Ingestion~~	~~actual~~	~~5~~	~~1,000~~	~~700~~	~~10,000~~	~~1,200~~	~~400~~
		~~potential~~	~~290~~	~~7,300~~	~~3,700~~	~~73,000~~	~~75,000~~	~~40,000~~
	~~Groundwater Vapor to Enclosed Space~~	~~all~~	~~1,540~~	~~20,190~~	~~46,000~~	~~NA~~	~~2,200,000~~	~~NA~~
	~~Groundwater to Plastic Water Line~~	~~all~~	~~290~~	~~7,300~~	~~3,700~~	~~73,000~~	~~75,000~~	~~40,000~~
	~~Surface Water~~	~~all~~	~~290~~	~~1,000~~	~~3,700~~	~~73,000~~	~~75,000~~	~~40,000~~

Media	Exposure Pathway	Receptor	Group 1				Group 2: TEH	
			Benzene	Toluene	Ethylbenzene	Xylenes	Diesel*	Waste Oil
Soil (mg/kg)	Soil Leaching to Groundwater	all	0.54	42	15	NA	3,800	NA
	Soil Vapor to Enclosed Space	all	1.16	48	79	NA	47,500	NA
	Soil to Plastic Water Line	all	1.8	120	43	NA	10,500	NA

NA: Not applicable. There are no limits for the chemical for the pathway, because for groundwater pathways the concentration for the designated risk would be greater than the solubility of the pure chemical in water, and for soil pathways the concentration for the designated risk would be greater than the soil concentration if pure chemical were present in the soil.

TEH: Total Extractable Hydrocarbons. The TEH value is based on risks from naphthalene, benzo(a)pyrene, benz(a)anthracene, and chrysene. Refer to Appendix B for further details.

Diesel*. Standards in the Diesel column apply to all low volatile petroleum hydrocarbons except waste oil.

135.9(2) *Conditions requiring Tier 1 site assessment.* Unless owners and operators choose to conduct a Tier 2 assessment, the presence of bedrock requires a Tier 2 assessment as provided in 135.8(5), or these rules otherwise require preparation of a Tier 2 site assessment, a Tier 1 site assessment must be completed in response to release confirmation as provided in rule 135.6(455B), or tank closure investigation under 135.15(455B), or other reliable laboratory analysis which confirms the presence of contamination above the action levels in 135.14(455B).

135.9(3) *Tier 1 assessment report.* Unless directed to do otherwise by the department or the owners or operators choose to prepare a Tier 2 site cleanup report, owners and operators must assemble information about the site and the nature of the release in accordance with the department Tier 1 guidance, including information gained while confirming the release under 135.6(455B), tank closure under 135.15(455B) or completing the initial abatement measures in 135.7(1) and 135.7(2). This information must include, but is not necessarily limited to, the following:

a. Data on the nature and estimated quantity of release.

b. Results of any release investigation and confirmation actions required by subrule 135.6(3).

c. Results of the free product investigations required under 135.7(3)*"a"*(6), to be used by owners and operators to determine whether free product must be recovered under 135.7(5).

d. Chronology of property ownership and underground storage tank ownership, identification of the person(s) having control of, or having responsibility for the daily operation of the underground storage tanks and the operational history of the underground storage tank system. The operational history shall include, but is not limited to, a description of or suspected known subsurface or aboveground releases, past remediation or other corrective action, type of petroleum product stored, recent tank and piping tightness test results, any underground storage tank system repairs, upgrades or replacements and the underground storage tank and piping leak detection method being utilized. The operational history shall confirm that current release detection methods and record keeping comply with the requirements of 135.5(455B), that all release detection records have been reviewed and report any evidence that a release detection standard has been exceeded as provided in 135.5(4) and 135.5(5).

e. Appropriate diagrams of the site and the underground storage tank system and surrounding land use, identifying site boundaries and existing structures and uses such as residential properties, schools, hospitals, child care facilities and a general description of relevant land use restrictions and known future land use.

f. Current proof of financial responsibility as required by 136.19(455B) and 136.20(455B) and the status of coverage for corrective action under any applicable financial assurance mechanism or

other financial assistance program.

g. A receptor survey including but not limited to the following: existing buildings, enclosed spaces (basements, crawl spaces, utility vaults, etc.), conduits (gravity drain lines, sanitary and storm sewer mains and service lines), ~~plastic~~ water lines and other utilities within 500 feet of the source. For conduits and enclosed spaces, there must be a description of construction material, conduit backfill material, slope of conduit and trenches (include flow direction of sewers), burial depth of utilities or subsurface enclosed spaces, and the relationship to groundwater elevations.

h. An explosive vapor survey of enclosed spaces where there may be the potential for buildup of explosive vapors. The groundwater professional must provide a specific justification for not conducting an explosive vapor survey.

i. A survey of all surface water bodies within 200 feet of the source.

j. A survey of all active, abandoned and plugged groundwater wells within 1,000 feet of the source with a description of construction and present or future use.

k. Accurate and legible site maps showing the location of all groundwater monitoring wells, soil borings, field screening locations and screening values, and monitoring well and soil boring construction logs.

l. A tabulation of all laboratory analytical results for chemicals of concern and copies of the laboratory analytical reports.

m. Results of hydraulic conductivity testing and description of the procedures utilized.

n. A Tier 1 site assessment in accordance with the department's Tier 1 guidance. The Tier 1 report shall be submitted on forms and in a format prescribed by this guidance. The Tier 1 data analysis shall be performed by using computer software developed by the department or by using the computer software's hard-copy version.

135.9(4) *Groundwater ingestion pathway assessment.* The groundwater ingestion pathway addresses the potential for human ingestion of petroleum-regulated substances from existing groundwater wells or potential drinking water wells.

a. Pathway completeness. This pathway is considered complete if: (1) there is a drinking or non-drinking water well within 1,000 feet of the source(s) exhibiting the maximum concentrations of the chemicals of concern; or (2) the first encountered groundwater is a protected groundwater source.

b. Receptor evaluation. A drinking or non-drinking water well within 1,000 feet of the source(s) is an actual receptor. The Tier 1 levels for actual receptors apply to drinking water wells and the Tier 1 levels for potential receptors apply to non-drinking water wells. Potential receptor points of exposure exist if the first encountered groundwater is a protected groundwater source but no actual receptors presently exist within 1,000 feet of the source.

c. Pathway clearance. If the pathway is incomplete, no further action is required for this pathway. If the Tier 1 level for actual or potential receptors is not exceeded, no further action is required for this pathway. Groundwater wells that are actual or potential receptors may be plugged in accordance with 567—Chapter 39 and 567—Chapter 49 and may result in no further action clearance if the groundwater is not a protected groundwater source and the pathway is thereby incomplete.

d. Corrective action response. If maximum concentrations exceed the applicable Tier 1 levels for either actual or potential receptors, a Tier 2 assessment must be conducted unless effective institutional controls are implemented as provided below. Technological controls are not acceptable at Tier 1 for this pathway. Abandonment and plugging of drinking and non-drinking water wells in accordance with 567—Chapters 39 and 49 is an acceptable corrective action response.

e. Use of institutional controls. To apply an effective institutional control, if drinking or non-drinking water wells are present within 1,000 feet of the source, and the applicable Tier 1 level is exceeded, the well(s) for which there is an exceedence must be properly plugged. If the groundwater is a protected groundwater source and the maximum concentrations do not exceed the Tier 1 level for potential receptors but do exceed the Tier 1 level for actual receptors, the owner or operator must provide notification of site conditions on a department form to the department water supply section, or if a county has delegated authority, then the designated county authority responsible for issuing

private water supply construction permits or regulating non-public water well construction as provided in 567—Chapters 38 and 49.

If the groundwater is a protected source and the maximum concentrations exceed the Tier 1 level for potential receptors, the owner or operator must (1) implement an institutional control prohibiting the use of the groundwater for installation of drinking and non-drinking water wells within 1,000 feet of the source; and (2) provide notification as provided above. If an effective institutional control is not feasible, a Tier 2 assessment must be performed for this pathway in accordance with rule 135.10(455B).

f. Receptor evaluation for public water supply wells. Rescinded IAB 3/11/09, effective 4/15/09.

135.9(5) *Soil leaching to groundwater pathway assessment.* This pathway addresses the potential for soil contamination to leach to groundwater creating a risk of human exposure through the groundwater ingestion pathway.

a. Pathway completeness. If the groundwater ingestion pathway is complete, the soil leaching to groundwater pathway is considered complete.

b. Receptor evaluation. There is a single receptor type for this pathway and one applicable Tier 1 level.

c. Pathway clearance. If the pathway is incomplete or the pathway is complete and the maximum concentrations of chemicals of concern do not exceed the Tier 1 levels, no further action is required for assessment of this pathway.

d. Corrective action response. If the Tier 1 levels are exceeded for this pathway, a Tier 2 assessment must be conducted or alternatively, institutional controls or soil excavation may be undertaken in accordance with 135.9(7)*"h."*

e. Use of institutional controls. Institutional controls must satisfy the conditions applicable to the groundwater ingestion pathway as provided in 135.9(4)*"e."*

135.9(6) *Groundwater vapor to enclosed space pathway assessment.* This pathway addresses the potential for vapors from contaminated groundwater to migrate to enclosed spaces where humans could inhale chemicals of concern at unacceptable levels. This pathway assessment assumes the health-based Tier 1 levels will adequately protect against any associated short- and long-term explosive risks.

a. Pathway completeness. This pathway is always considered complete for purposes of Tier 1 and must be evaluated.

b. Explosive vapor survey. An explosive vapor survey must be conducted in accordance with procedures outlined in the department Tier 1 guidance. If potentially explosive levels are detected, the groundwater professional must notify the owner or operator with instructions to report the condition in accordance with 567—Chapter 131. The owner or operator must begin immediate response and abatement procedures in accordance with 135.7(455B) and 567—Chapter 133.

c. Receptor evaluation. For purposes of Tier 1, there is one receptor type for this pathway and the Tier 1 level applies regardless of the existence of actual or potential receptors.

d. Pathway clearance. No further action is required for this pathway, if the maximum groundwater concentrations do not exceed the Tier 1 levels for this pathway.

e. Corrective action response. If the maximum concentrations exceed the Tier 1 levels for this pathway, a Tier 2 assessment of this pathway must be conducted unless institutional controls are implemented. Technological controls are not acceptable at Tier 1 for this pathway.

f. Use of institutional controls. An institutional control must be effective to prohibit the placement of enclosed space receptors within 500 feet of the source.

135.9(7) *Soil vapor to enclosed space pathway assessment.* This pathway addresses the potential for vapors from contaminated soils to migrate to enclosed spaces where humans could inhale chemicals of concern at unacceptable levels. This pathway assessment assumes health-based screening levels at Tier 1 will adequately protect against short- and long-term explosive risks.

a. Pathway completeness. This pathway is always considered complete for purposes of Tier 1 and must be evaluated.

b. Explosive vapor survey. An explosive vapor survey must be conducted in accordance with procedures outlined in the department Tier 1 guidance. If potentially explosive levels are detected, the groundwater professional must notify the owner or operator with instructions to report the condition in accordance with 567—Chapter 131. The owner or operator must begin immediate response and abatement procedures in accordance with 135.7(455B) and 567—Chapter 133.

c. Receptor evaluation. For purposes of Tier 1, there is one receptor type for this pathway, and the Tier 1 level applies regardless of existing or potential receptors.

d. Pathway clearance. No further action is required for this pathway, if the maximum soil concentrations do not exceed the Tier 1 levels for this pathway. If the Tier 1 levels are exceeded, soil gas measurements may be taken in accordance with the Tier 2 guidance at the area(s) of maximum concentration. Subject to confirmation sampling, if the soil gas measurements do not exceed the target levels in 135.10(7)*"f,"* no further action is required for this pathway. If the Tier 1 level is not exceeded but the soil gas measurement exceeds the target level, further action is required for the pathway.

e. Soil gas samples. To establish that the soil gas measurement is representative of the highest expected levels, a groundwater professional must obtain two soil gas samples taken at least two weeks apart. One of the samples must be taken below the typical frostline depth during a seasonal period of lowest groundwater elevation.

f. Corrective action response. If the maximum concentrations exceed the Tier 1 levels and the soil gas measurements exceed target levels for this pathway, or if no soil gas measurement was taken, a Tier 2 assessment of this pathway must be conducted unless institutional controls are implemented or soil excavation is conducted as provided below. Technological controls are not acceptable at Tier 1 for this pathway.

g. Use of institutional controls. An institutional control must be effective to eliminate the placement of enclosed space receptors within 500 feet of the source.

h. Soil excavation. Excavation of contaminated soils for the purpose of removing soils contaminated above the Tier 1 levels is permissible as an alternative to conducting a Tier 2 assessment. Adequate field screening methods must be used to identify maximum concentrations during excavation. At a minimum, one soil sample must be taken for field screening every 100 square feet of the base and each sidewall. Soil samples must be taken for laboratory analysis at least every 400 square feet of the base and each sidewall of the excavated area to confirm that remaining concentrations are below Tier 1 levels. If the excavation is less than 400 square feet, a minimum of one sample must be analyzed for each sidewall and the base.

135.9(8) *Groundwater to ~~plastic~~ water line pathway assessment.* This pathway addresses the potential for creating a drinking water ingestion risk due to contact with ~~plastic~~ water lines and causing infusion to the drinking water.

a. Pathway completeness and receptor evaluation.

(1) Actual receptors. This pathway is considered complete for an actual receptor if there is an existing ~~plastic~~ water line within 200 feet of the source and the first encountered groundwater is less than 20 feet below ground surface.

(2) Potential receptors. This pathway is considered complete for a potential receptor if the first encountered groundwater is less than 20 feet below ground surface.

b. Pathway clearance. If the pathway is not complete, no further action is required for this pathway. If the pathway is complete and the maximum concentrations of all chemicals of concern do not exceed the Tier 1 levels for this pathway, no further action is required for this pathway.

c. Utility company notification. The utility company which supplies water service to the area must be notified of all actual and potential ~~plastic~~ water line impacts. For polybutylene, polyethylene, and asbestos-cement or other sensitive material pipe, notification of potential water line impacts must be completed as soon as knowledge of a potential risk is determined. For all other pipe, ~~Notification~~ notification of potential ~~plastic~~ water line impacts may be postponed until completion of Tier 2 if a Tier 2 assessment is required.

d. Corrective action response.

(1) For actual receptors, if the Tier 1 levels are exceeded, all ~~plastic~~ water lines within 200 feet must be replaced with ~~nonplastic~~ water line~~s~~ materials and gasket materials of appropriate construction as per current Ten States Standards construction requirements or as otherwise approved with no less than nitrile or FKN gaskets or the ~~plastic~~ water lines must be relocated beyond the 200-foot distance. A Tier 2 assessment must be conducted for this pathway if lines are not replaced or relocated.

(2) For potential receptors, upon utility company notification, no further action will be required for this pathway.

135.9(9) *Soil to ~~plastic~~ water line pathway assessment.* This pathway addresses the potential for creating a drinking water ingestion risk due to contact with ~~plastic~~ water lines and infusion into the drinking water.

a. Pathway completeness.

(1) Actual receptors. This pathway is considered complete for an actual receptor if a ~~plastic~~ water line exists within 200 feet of the source.

(2) Potential receptors. This pathway is always considered complete for potential receptors.

b. Pathway clearance. If the pathway is not complete for actual receptors, no further action is required for this pathway. If the pathway is complete for actual receptors and the maximum concentrations of all chemicals of concern do not exceed Tier 1 levels for this pathway, no further action is required. For potential receptors, upon utility company notification, no further action will be required for this pathway for potential receptors.

c. Utility company notification. The utility company which supplies water service to the area must be notified of all actual and potential ~~plastic~~ water line impacts. For polybutylene, polyethylene, and asbestos-cement or other sensitive material pipe, notification of potential water line impacts must be completed as soon as knowledge of a potential risk is determined. For all other pipe, ~~Notification~~ notification of potential ~~plastic~~ water line impacts may be postponed until completion of Tier 2 if a Tier 2 assessment is required.

d. Corrective action response. For actual receptors, if the Tier 1 levels are exceeded for this pathway, the ~~plastic~~ water lines may be replaced with ~~nonplastic~~ water line~~s~~ materials and gasket materials of appropriate construction as per current Ten States Standards construction requirements in a petroleum-contaminated area or as otherwise approved by the department with no less than nitrile or FKN gaskets or the ~~plastic~~ water lines must be relocated to a distance beyond 200 feet of the source. Excavation of soils to below Tier 1 levels may be undertaken in accordance with 135.9(7)*"h."* If none of these options is implemented, a Tier 2 assessment must be conducted for this pathway.

135.9(10) *Surface water pathway assessment.* This pathway addresses the potential for contaminated groundwater to impact surface water bodies creating risks to human health and aquatic life.

a. Pathway completeness. This pathway is considered complete if a surface water body is present within 200 feet of the source. For purposes of Tier 1, surface water bodies include both general use segments and designated use segments as provided in 567—subrule 61.3(1).

b. Receptor evaluation. The Tier 1 levels for this pathway only apply to designated use segments of surface water bodies as provided in 567—subrules 61.3(1) and 61.3(5). The point of compliance is the source with the highest concentrations of chemicals of concern. General use segments of surface water bodies as provided in 567—paragraph 61.3(1)*"a"* are only subject to the visual inspection criteria.

c. Visual inspection requirements. A visual inspection of all surface water bodies within 200 feet of the source must be conducted to determine if there is evidence of a sheen on the water or there is evidence of petroleum residue along the bank. If a sheen or residue is evident or has been reported to be present, the groundwater professional must make a sufficient investigation to reasonably determine its source. If in the opinion of the groundwater professional, the sheen is not associated with the underground storage tank site, the professional must report and reasonably justify this opinion. If in

the opinion of the groundwater professional the sheen is not a petroleum-regulated substance, a sample must be laboratory tested in accordance with 135.16(455B) to confirm it is not a petroleum-regulated substance.

d. Pathway clearance. If the pathway is not complete or it is complete and the maximum concentrations of all chemicals of concern at the point of compliance do not exceed the Tier 1 levels and there is no petroleum sheen or residue attributable to the site, no further action is required for assessment of this pathway.

e. Corrective action response. If a Tier 1 level is exceeded for any chemical of concern for a designated use segment within 200 feet of the source, or the groundwater professional determines the presence of a petroleum-regulated substance sheen or residue, a Tier 2 assessment of this pathway must be conducted.

135.9(11) *Tier 1 submission and review procedures.*

a. Within 90 calendar days of release confirmation or another reasonable period of time determined by the department, owners and operators must submit to the department a Tier 1 report in a format prescribed by the department and in accordance with these rules and the department Tier 1 guidance.

b. If the owner or operator elects to prepare a Tier 2 site cleanup report instead of a Tier 1 assessment, the department must be notified in writing prior to the expiration of the Tier 1 submission deadline. The Tier 2 site cleanup report must be submitted to the department in accordance with rule 135.10(455B) within 180 calendar days of release confirmation or another reasonable period of time determined by the department.

c. Tier 1 report completeness and accuracy. A Tier 1 report is considered to be complete if it contains all the information and data required by this rule and the department Tier 1 guidance. The report is accurate if the information and data is reasonably reliable based first on application of the standards in these rules and department guidance and second, generally accepted industry standards.

d. The certified groundwater professional shall include the following certification with the Tier 1 site assessment report:

I, _____, Groundwater Professional Certification No. _____, am familiar with all applicable requirements of Iowa Code section 455B.474 and all rules and procedures adopted thereunder including, but not limited to, 567—Chapter 135 and the Department of Natural Resources Tier 1 guidance. Based on my knowledge of those documents and information I have prepared and reviewed regarding this site, UST Registration No. _____, LUST No._____ I certify that this document is complete and accurate as provided in 567 IAC 135.9(11)*"c"* and meets the applicable requirements of the Tier 1 site assessment.

Signature:

Date:

e. Upon receipt of the Tier 1 report, the department may review it by reliance on the groundwater professional's certification and a summary review for completeness and accuracy or may undertake a more complete review to determine completeness and accuracy and compliance with department rules and guidance. If the Tier 1 report proposes to classify the site "no action required," the department may review the report as provided in 135.9(11)*"g."*

f. If a "no action required" site classification is not proposed, the department must within 60 days approve the Tier 1 report for purposes of completeness or disapprove of the report upon a finding of incompleteness, inaccuracy or noncompliance with these rules. If no decision is made within this time period, the report is deemed to be accepted for purposes of completeness. The department retains the authority to review the report at the time a no action required site classification is proposed.

g. No action required site classification review. The department will review each Tier 1 report which proposes to classify a site as "no action required" to determine whether the data and information are complete and accurate, the data and information comply with department rules and guidance and the site classification proposal is reasonably supported by the data and information.

135.9(12) *Tier 1 site classification and corrective action response.*

a. No action required site classification. At Tier 1, a site is only eligible for a "no action required" classification. To be classified as no action required, each pathway must meet the requirements for pathway clearance as specified in this rule. If the department determines a no action required site classification is appropriate, a no further action certificate will be issued as provided in 135.12(10).

b. Where an individual pathway or a chemical group meets the requirements for clearance but the site is not entitled to a no action required classification, only those pathways and chemical groups which do not meet the no further action requirements must be evaluated as part of a Tier 2 assessment as provided in rule 135.10(455B).

c. Compliance monitoring and confirmation sampling. Compliance monitoring is not an acceptable corrective action at Tier 1. Except for soil gas sampling under 135.9(7), confirmation sampling to verify a sample does not exceed a Tier 1 level is not required. However, the department retains the authority to require confirmation sampling from existing groundwater monitoring wells if a no action required classification is being proposed at Tier 1 and the department has a reasonable basis to question the representative validity of the samples based on, for example, the seasonal bias of the sampling, evidence of multiple sources of releases, marginal groundwater monitoring well locations and analytical variability.

d. Expedited corrective action. Expedited corrective action is permissible in accordance with 135.12(11).

[**ARC 7621B**, IAB 3/11/09, effective 4/15/09]

567—135.10(455B) Tier 2 site assessment policy and procedure.

135.10(1) *General conditions.* A Tier 2 site assessment must be conducted and a site cleanup report submitted for all sites which have not obtained a no action required site classification and for all pathways and chemicals of concern groups that have not obtained no further action clearance as provided in 135.9(455B). If in the course of conducting a Tier 2 assessment, data indicates the conditions for pathway clearance under Tier 1 no longer exist, the pathway shall be further assessed under this rule. The Tier 2 assessment and report must be completed whenever free product is discovered as provided in 135.7(455B). If the owner or operator elects to complete the Tier 2 site assessment without doing a Tier 1 assessment, all the Tier 1 requirements as provided in 135.9(455B) must be met in addition to requirements under this rule.

a. Guidance. The Tier 2 site assessment shall be conducted in accordance with the department's "Tier 2 Site Assessment Guidance" and these rules. The site cleanup report shall be submitted on forms and in a format prescribed by this guidance. The Tier 2 data analysis shall be performed by using computer software developed by the department or by using the computer software's hard-copy version.

b. Classification. At Tier 2, individual pathways may be classified as high risk or low risk or no action required and separate classification criteria may apply to actual and potential receptors for any pathway. A single pathway may have multiple classifications based on actual or potential receptor evaluations. A pathway must meet both the criteria for actual and potential receptors for the pathway to obtain a classification of no action required. Sites may have multiple pathway classifications. For a site to obtain a no action required classification, all pathways must meet the individual pathway criteria for no action required classification.

c. Public right-of-way. As a general rule, public right-of-way will not be considered an area of potential receptor exposure except for potential sanitary sewer evaluation under the soil and groundwater vapor pathways, subrules 135.10(6) and 135.10(7).

135.10(2) *General Tier 2 assessment procedures.*

a. Objectives. The objective of a Tier 2 assessment is to collect site-specific data and with the use of Tier 2 modeling determine what actual or potential receptors could be impacted by chemicals of concern and what concentrations at the source are predicted to achieve protection of these receptors.

Both Tier 1 and Tier 2 are based on achieving similar levels of protection of human health, safety and the environment.

b. Groundwater modeling. Tier 2 uses fate and transport models to predict the maximum distance groundwater contamination is expected to move and the distribution of concentrations of chemicals of concern within this area. The model is used for two basic purposes. One, it is used to predict at what levels of concentration contamination would be expected to impact actual and potential receptors. Two, it is used to determine a concentration at the source which if achieved, and after dispersion and degradation, would protect actual and potential receptors at the point of exposure. In predicting the transport of contaminants, the models assume the contaminant plume is at "steady state" such that concentrations throughout the plume have reached a maximum level and are steady or decreasing. The Tier 2 models are only designed to predict transport in a direct line between the source and downgradient to a receptor. In order to more reasonably define a modeled plume in all directions, paragraph *"i"* defines a method of decreasing modeled concentrations as a percentage of their distance in degrees from the downgradient direction.

c. Soil vapor models. The soil vapor models are vertical transport models and do not use modeling to predict soil contaminant transport horizontally to receptors.

d. Soil leaching to groundwater modeling. The soil leaching to groundwater model is a model that predicts the maximum concentrations of chemicals of concern that would be expected in groundwater due to vertical leaching from the area of maximum soil concentrations and then incorporates the groundwater transport models to predict contaminant transport through groundwater pathways.

e. Modeling default parameters. The Tier 2 model formulas and applicable parameters are designated in Appendix B and must be followed unless otherwise specified in these rules. Unless otherwise specified, target levels at a point of exposure may be the Tier 1 level(s) or may be determined using site-specific parameters. The target level at a point of exposure is calculated using the Tier 1 formulas in Appendix A and either site-specific measurements or the default values for those parameters identified as "optional" and "site-specific" in Appendix B.

f. Source width. The source width and source length are variables used in modeling and must be determined by the following criteria and as specified in the department's Tier 2 guidance. The following are not to be used as criteria for defining the extent of the contaminant plumes.

(1) Source width (equals S_w in models) for groundwater transport modeling. The sum of group one chemical (benzene, toluene, ethylbenzene, xylenes or "BTEX") concentrations for each groundwater sample is determined and the location of the sample with the maximum total BTEX is identified. Linear interpolation is used to estimate the area where groundwater concentrations would be expected to exceed 50 percent of the maximum BTEX value, and this area is considered for the source width measurement. The same procedure is used to determine source width for group two chemicals, using TEH in groundwater. The width of the groundwater contamination perpendicular to estimated groundwater flow direction (S_w) is determined, and the larger of either group one or group two chemicals is used in the groundwater transport model.

(2) Source width (S_w) and source length (equals W in models) for soil leaching to groundwater transport modeling. Both the source width perpendicular to the estimated groundwater flow direction (S_w) and the source length parallel to the estimated groundwater flow direction (W) are used in the soil leaching to groundwater model. The sum of BTEX concentrations for each soil sample is determined and the location of the sample with the maximum total BTEX is identified. Concentrations from both the vadose zone and the saturated zone must be considered when determining the maximum. Linear interpolation is used to estimate the area where soil concentrations would be expected to exceed 50 percent of the maximum BTEX value, and this area is considered for the source width and source length measurements. The same procedure is used to determine source width for group 2 chemicals, using TEH in soil. Source width and source length measurements for BTEX in groundwater are also taken following the same linear interpolation criteria in *"f"*(1) above. The source width value used in the model is the greatest of either the soil source width measurements or the groundwater source width

measurement. The source length value used in the model is the greatest of either of the soil source length measurements or the groundwater length measurement.

(3) Estimating source width when free product is present. Groundwater from wells with free product must be analyzed for BTEX and the source width and source length are estimated using the criteria in 135.10(2)*"f"*(1) and 135.10(2)*"f"*(2) above. For those sites with approved site cleanup reports and free product present in wells but actual BTEX values are not available, source width and source length may be estimated in accordance with 135.10(2)*"f"*(1) and 135.10(2)*"f"*(2) using the default BTEX values for groundwater in 135.18(4) or estimated by using the area representing half the distance between wells with free product and wells without free product, whichever method is greater.

g. Modeled simulation line. The simulation line represents the predicted maximum extent of groundwater contamination and distribution of contaminant concentrations between the source(s) and actual or potential receptor locations. The model calculates the simulation line using maximum concentrations at the source(s) and predicting the amount of dispersion and degradation. Modeled data in the simulation line are compared with actual field data to verify the predictive validity of the model and to make risk classification decisions.

h. Modeled site-specific target level (SSTL) line. The modeled SSTL line represents acceptable levels of contaminant concentrations at points between and including the source(s) and an applicable point(s) of exposure or other point(s) of compliance (ex. a potential receptor point of exposure). The SSTL line is calculated by assuming an applicable target level concentration at the point(s) of exposure or point(s) of compliance and modeling back to the source to determine the maximum concentrations at the source (SSTL) that must be achieved to meet the target level at the point of exposure or compliance. Comparison of field data to this SSTL line is used to determine a risk classification and determine appropriate corrective action response.

i. Crossgradient and upgradient modeling. In determining the SSTL line and the simulation line in directions other than downgradient, the modeled contaminant concentrations are applied to reduced distances, as specified in the "Tier 2 Guidance." The modeled results are applied to 100 percent of the distance within an angle of 30 degrees on either side of the range of downgradient directions, as specified in Tier 2 guidance. The modeled results are applied to 20 percent of the distance in the upgradient direction and directly proportional distances between these two outer limits. If the groundwater gradient is less than 0.005 or the groundwater contaminant plume shows no definitive direction or shows directional reversals, the modeled concentrations are applied to 100 percent of the distance in all directions from the source. As the downgradient velocity increases, the upgradient modeled distance is reduced to less than 20 percent of the downgradient modeled distance.

j. Plume definition. The purpose of plume definition at Tier 2 is to obtain sufficient data to determine the impact on actual and potential receptors, to determine and confirm the highest levels of contamination, to verify the validity of the models, and to determine groundwater flow direction. The number and location of borings and monitoring wells and the specificity of plume definition will depend on the pathway or pathways being assessed and the actual or potential receptors of concern. Unless otherwise specified, groundwater and soil contamination shall be defined to Tier 1 levels for the applicable pathways. Linear interpolation between two known concentrations must be used to delineate plume extent. Samples with no concentrations detected shall be considered one-half the detection limit for interpolation purposes.

k. Pathway completeness. Unless a pathway has obtained clearance under Tier 1, each pathway must be evaluated at Tier 2. Pathways are generally considered complete (unless otherwise specified) and receptors affected if actual receptors or potential receptor points of exposure exist within the modeled contaminant plume using the modeled simulation line calculated to the applicable target level at a point of exposure. If the actual contaminant plume exceeds the modeled plume, the pathway is complete and must be evaluated if actual or potential points of exposure exist within a distance extending 10 percent beyond the edge of the defined plume.

l. Points of exposure and compliance. For actual receptors, the point(s) of exposure is the receptor. For potential receptors, the potential receptor point(s) of exposure is determined by using

actual plume definition or the modeled simulation line to determine all points which exceed the target level(s) for potential receptors. The potential receptor point(s) of exposure is the location(s) closest to the source where a receptor could reasonably exist and which is not subject to an institutional control; for example, the source is the potential receptor point of exposure if not subject to an institutional control or an adjoining property boundary line if that property is not subject to an institutional control. At Tier 2, the point(s) of exposure or potential receptor point(s) of exposure is a point of compliance unless otherwise specified. Other points of compliance are specified by rules and will generally include all points along the SSTL line for purposes of pathway and site classification and corrective action response.

m. Group two chemicals. At Tier 2, chemical-specific values for the four chemicals may be used or the largest of the four TEH default values. (Refer to Appendix B and department Tier 2 guidance for using the TEH conversion method for modeling.) If chemical-specific values are used, the analytical method must be approved by the department prior to its use.

135.10(3) Bedrock assessment.

a. General. As provided in 135.8(5), if bedrock is encountered before groundwater, special assessment procedures under this subrule apply. The Tier 2 assessment procedures apply to the extent they are not inconsistent with this subrule. The objectives of these special procedures are to avoid creating a preferential pathway for contamination through a confining layer to a bedrock aquifer; to avoid creating a preferential pathway to a fractured system, and to determine whether groundwater transport modeling can be used and, if not, what alternative procedures are required. The owner or operator may choose to conduct a Tier 3 assessment under 135.11(455B) as an alternative to proceeding under this subrule. For sites where bedrock is encountered before groundwater, there are three general categories of site conditions which determine the assessment procedures that apply:

(1) Nongranular bedrock. Nongranular bedrock is bedrock which is determined to not act as a granular aquifer as provided in subparagraph (2). Nongranular bedrock generally has some type of fractured system where groundwater transport modeling cannot be applied and which makes it difficult to define the extent of contamination.

(2) Granular bedrock. Granular bedrock is bedrock which is determined to act as a granular aquifer and for which monitoring wells do not exist at the source as of August 15, 1996. For purposes of this rule, a granular aquifer is one that shows no extraordinary variations or inconsistencies in groundwater elevations across the site, groundwater flow, hydraulic conductivities, or total dissolved solid concentrations among monitoring wells. Although the extent of contamination can be defined in granular bedrock, groundwater transport modeling cannot be used because there are no monitoring wells at the source.

(3) Exempt granular bedrock. Exempt granular bedrock is bedrock which is determined to act as a granular aquifer as provided in subparagraph (2) and for which monitoring wells exist at the source as of August 15, 1996. Sites in exempt granular bedrock shall be evaluated using the normal Tier 1 or Tier 2 procedures in this rule. Nongranular bedrock is not exempt from this subrule even if groundwater monitoring wells exist at the source.

b. Exempt soil pathways. The soil vapor to enclosed space pathway and the soil to ~~plastic~~ water lines pathway shall be assessed under the normal Tier 2 procedures in subrules 135.10(7) and 135.10(9) respectively. In all cases, the normal assessment must comply with the policy of avoiding a preferential pathway to groundwater consistent with 135.8(5) and this subrule.

c. Soil and groundwater assessment. The vertical and horizontal extent of soil contamination shall first be defined to Tier 1 levels for the soil leaching to groundwater pathway without drilling into bedrock. A minimum of three groundwater monitoring wells shall be located and installed between 50 to 100 feet beyond the soil contamination Tier 1 levels to avoid creating a preferential pathway. Analytical data as normally required by these rules and guidance must be obtained.

d. Soil contamination remediation. For all sites where soil contamination exceeds the soil leaching to groundwater Tier 1 levels, soil excavation or other active soil remediation technology must be conducted in accordance with department guidance to reduce concentrations to below this Tier 1

level. Soil remediation monitoring must be conducted in accordance with 135.12(455B).

e. Groundwater plume definition. If it is determined the groundwater acts in a manner consistent with a granular aquifer as provided in subparagraph *"a"*(2) and guidance but does not meet the criteria for exemption under subparagraph *"a"*(3), the plume must be defined. The policy of avoiding the creation of a preferential pathway to the bedrock aquifer in accordance with 135.8(5) must be followed.

f. Soil leaching to groundwater ingestion pathway. Under this subrule, the soil leaching to groundwater pathway only need be evaluated in combination with the groundwater ingestion pathway. Because of the policies requiring soil remediation to the soil leaching to groundwater Tier 1 levels under paragraphs *"d"* and *"k,"* the soil leaching pathway target levels applicable to other groundwater transport pathways and other soil pathways would not be exceeded. If a soil leaching to groundwater Tier 1 level is exceeded, the pathway is high risk.

g. Special procedures for the groundwater ingestion pathway.

(1) A protected groundwater source is assumed without measurements of hydraulic conductivity for all sites designated as granular or nongranular bedrock.

(2) Groundwater well receptor evaluation for granular and nongranular bedrock designations. All drinking and non-drinking water wells within 1,000 feet of the source must be identified and tested for chemicals of concern. All public water supply systems within one mile of the source must be identified and raw water tested for chemicals of concern. If no drinking water wells are located within 1,000 feet of the source, all the area within 1,000 feet is considered a potential receptor point of exposure.

(3) Target levels. The following target levels apply regardless of granular aquifer designation. If drinking water wells are within 1,000 feet of the source, the applicable target level is the groundwater ingestion pathway Tier 1 level for actual receptors. If non-drinking water wells are within 1,000 feet of the source, the applicable target level is the groundwater ingestion pathway Tier 1 level for potential receptors. For potential wells, the applicable target level is the groundwater ingestion pathway Tier 1 level for potential receptors.

(4) Sentry well. If the Tier 1 level for actual receptors is exceeded at sites designated as granular bedrock and the receptor has not yet been impacted, a monitoring well shall be placed between the source and an actual receptor, outside the defined plume and approximately 200 feet from the actual receptor. For alternative well placement, the certified groundwater professional must provide justification and obtain department approval. This monitoring well is to be used for monitoring potential groundwater contamination of the receptor.

(5) High risk classification. A site where bedrock is encountered before groundwater shall be classified high risk for this pathway if any of the following conditions exist regardless of granular aquifer determination: The target level at any actual receptor is exceeded; drinking water well receptors are present within 1,000 feet and groundwater concentrations in any monitoring well exceed the groundwater ingestion Tier 1 level for actual receptors; non-drinking water wells are within 1,000 feet and groundwater concentrations in any monitoring well exceed the groundwater ingestion pathway Tier 1 level for potential receptors; or for sites designated nongranular bedrock, if groundwater concentrations for chemicals of concern from any public water system well within one mile of the source exceed 40 percent of the Tier 1 level for actual receptors, and groundwater concentrations in any monitoring well exceed the groundwater ingestion Tier 1 level for actual receptors. Corrective action shall be undertaken as provided in paragraph *"k."*

(6) Low risk classification. Sites without an actual receptor within 1,000 feet shall be classified as low risk for this pathway if no high risk conditions exist, and the Tier 1 level for potential receptors is exceeded. The site is subject to monitoring as provided in paragraph *"l."* If an actual receptor exists within 1,000 feet, a site designated as granular or nongranular bedrock shall be classified low risk for this pathway when soil contamination has been removed or remediated to below the soil leaching to groundwater Tier 1 levels, and all groundwater monitoring wells are non-detect or below the applicable target level for actual and potential receptors. A site may be reclassified to no action

required for this pathway after all monitoring wells meet the exit monitoring criteria as specified in paragraph *"l."* (NOTE: Exit monitoring is required because groundwater monitoring wells are not located at the source or if they are, the data is highly unreliable given the nature of bedrock.) If actual receptors do not exist or have been properly plugged and concentrations exceed the Tier 1 level for potential receptors, institutional controls and notification to permitting authorities may be employed in accordance with 135.10(4)*"i."* The institutional control must prohibit use of groundwater for 1,000 feet.

h. Special procedures for the groundwater vapor to enclosed space pathway.

(1) Soil gas plume. Soil gas measurements must be taken regardless of granular aquifer determination and in accordance with Tier 2 guidance to determine a soil gas plume. Soil gas where practical should be measured at the soil-bedrock interface. At a minimum, soil gas must be measured at the suspected area of maximum contamination and near the three monitoring wells with the highest concentrations that exceed the Tier 1 level for the groundwater to enclosed space pathway. Where the plume has been defined, soil gas measurements should be taken near wells exceeding the Tier 1 level. Other soil gas measurements must be taken as needed to define the extent of contamination where soil gas measurements exceed the soil gas vapor target levels.

(2) The soil gas target levels are those defined in 135.10(7)*"f."*

(3) High risk classification. A site designated as granular or nongranular bedrock shall be classified high risk for this pathway if an actual confined space receptor exists within 50 feet of the soil gas plume based on the soil gas target level as defined in 135.10(6).

(4) Low risk classification. A site designated as granular or nongranular bedrock shall be classified as low risk for this pathway if the soil gas exceeds the vapor target level at any point and no actual confined space receptors exist within 50 feet of the soil gas contaminant plume.

i. Special procedure for the groundwater to ~~plastic~~ water line pathway.

(1) Target level. The applicable target level is the Tier 1 level for ~~plastic~~ the specific type of water lines.

(2) High risk classification. A site designated as granular or nongranular bedrock shall be classified high risk for this pathway if the highest groundwater elevation is higher than three feet below the bottom of a ~~plastic~~ water line as provided in 135.10(8)*"a"*(1), risk classification cannot be determined as provided in 135.12(455B) due to limitations on placement of monitoring wells, and ~~plastic~~ water lines exist within 200 feet of a monitoring well which exceeds the Tier 1 level.

Comment [CR3]: Vapors are a concern with some types of pipe. We deferred this to the Vapor Intrusion group, but we need to ensure this will be discussed as part of the Vapor Intrusion group, or we will need to insert language to address the potential for vapor impacts to pipe.

j. Special procedures for the surface water pathway. Any surface water body within 200 feet of the source must be evaluated under the following for sites designated as granular or nongranular bedrock. The provisions of 135.10(10) apply to the extent they are not inconsistent with the following, including the visual inspection requirements.

(1) Point of compliance. The monitoring well closest to the surface water body must be used as the point of compliance to evaluate impacts to designated use segments as described in 135.10(10) and for general use segments that fail the visual inspection criteria of 135.10(10)*"b."* If the surface water criteria is exceeded for a designated use segment, an allowable discharge concentration must be calculated and met at the point of compliance. For general use segments failing the visual inspection criteria, the acutely toxic target level must be met at the point of compliance.

(2) High risk classification. A site designated as granular or nongranular bedrock shall be classified high risk for this pathway if the surface water body is within 200 feet of the source, risk classification cannot be determined as per 135.12(455B) due to limitations on placement of monitoring wells, and the monitoring well closest to the designated use segment exceeds the allowable discharge concentration. A general use segment failing the visual inspection criteria is high risk if, after the sheen is removed, the monitoring well closest to the general use segment exceeds the acutely toxic target level.

(3) Low risk classification. If the allowable discharge concentration is not exceeded at the point of compliance, the site shall be classified as low risk for this pathway and subject to monitoring under paragraph *"l."* The monitoring well closest to the receptor shall serve as the sentry well for

monitoring purposes.

k. High risk corrective action response. Owners and operators have the option to conduct a Tier 3 assessment in accordance with 135.11(455B).

(1) Groundwater ingestion pathway. For high risk sites, where soil exceeds the soil leaching to groundwater Tier 1 level for actual receptors, soil excavation or other active remediation of soils must be conducted in accordance with department guidance to reduce soil concentrations below the soil leaching Tier 1 level. Corrective action other than monitoring of groundwater is required at sites designated as nongranular bedrock if the actual receptor has been or is likely to be impacted. Corrective action other than monitoring of groundwater is required at sites designated as granular bedrock if the actual receptor has been impacted or the sentry well required by 135.10(3) *"g"*(4) has been impacted above Tier 1 levels. Acceptable corrective action for impacted or vulnerable groundwater wells may include active remediation, technological controls, institutional controls, well plugging, relocation, and well reinstallation with construction measures sufficient to prevent contaminant infiltration to the well and to prevent formation of a preferential pathway.

(2) Groundwater ingestion pathway high risk monitoring. For high risk sites designated as nongranular or granular bedrock, if the soil concentrations do not exceed the soil leaching to groundwater Tier 1 levels or have been reduced to this level by corrective action, and corrective action of groundwater is not required as in subparagraph (1), these sites shall be subject to groundwater monitoring as provided in paragraph *"l."* Corrective action other than monitoring of groundwater is required at sites designated as granular bedrock if groundwater concentrations exceed the applicable target level less than 200 feet from an actual receptor. Reevaluation of the potential for impact to actual receptors is required at sites designated as nongranular bedrock if concentrations from monitoring wells increases more than 20 percent of the previous samples.

(3) For water line pathways. For high risk sites, active remediation must be conducted to reduce concentrations below the applicable target levels, ~~including~~ water line and gasket replacement, or relocation, or use of institutional and technological controls. If lines are polybutylene, polyethylene, or asbestos-cement or other sensitive material, the lines must be removed or relocated. For all lines, if replacement is conducted, replacement water line and gasket materials shall be of appropriate construction as per current Ten States Standards construction requirements for replacement in a petroleum-contaminated area or as otherwise approved by the department with no less than nitrile or FKN gaskets.

(~~3~~4) Other pathways. For high risk sites other than groundwater ingestion and water lines, active remediation must be conducted to reduce concentrations below the applicable target levels ?? including the use of institutional and technological controls.

l. Monitoring. For high and low risk sites, annual monitoring at a minimum is required as specified below, and potential receptor status for low risk sites must be confirmed. Annual monitoring may be used to meet the exit requirements for no action required classification in accordance with paragraph *"m."*

(1) Groundwater in nongranular bedrock designations. All groundwater monitoring wells must be monitored at least annually.

(2) Groundwater in granular bedrock designations. The following monitoring wells must be monitored at least annually: a well with detected levels of contamination closest to the leading edge of the groundwater plume between the source and the receptor, and a sentry well with concentrations below the applicable target level consistent with subparagraph *"g"*(4) and paragraph *"j."*

(3) Soil gas. For sites where the soil gas target level is exceeded, annual monitoring of soil gas is required at the suspected area of maximum contamination and between the soil gas plume and any actual receptors within 100 feet of the soil gas plume.

m. No action required classification. A site may be given a no action required classification after conducting a Tier 2 assessment as provided in this subrule if maximum soil concentrations do not exceed the Tier 1 levels for the soil leaching pathway, and if groundwater exit monitoring criteria and soil gas confirmation sampling are met as specified below.

(1) Groundwater in nongranular bedrock designations. Exit monitoring requires that samples from all groundwater monitoring wells must not exceed the applicable target levels for annual sampling for three consecutive years.

(2) Groundwater in granular bedrock designations. Exit monitoring must be met in two ways: A monitoring well between the source and the receptor must not exceed applicable target levels for three sampling events, and samples must be separated by at least six months; and the three most recent consecutive groundwater samples from a monitoring well between the source and the receptor with detected levels of contamination must show a steady or declining trend and meet the following criteria: The first of the three samples must be more than detection limits, concentrations cannot increase more than 20 percent from the first of the three samples to the third sample; concentrations cannot increase more than 20 percent of the previous sample; and samples must be separated by at least six months.

(3) Soil gas. Confirmation sampling for soil gas must be conducted as specified in 135.12(6)*"c."*

n. After receiving a no action required classification, all monitoring wells must be properly plugged in accordance with 567—Chapters 39 and 49.

135.10(4) *Groundwater ingestion pathway assessment.*

a. Pathway completeness. Unless cleared at Tier 1, this pathway is complete and must be evaluated under any of the following conditions: (1) the first encountered groundwater is a protected groundwater source; or (2) there is a drinking water well or a non-drinking water well within the modeled groundwater plume or the actual plume as provided in 135.10(2)*"j"* and 135.10(2)*"k."*

b. Receptor evaluation. All drinking and non-drinking water wells located within 100 feet of the largest actual plume (defined to the appropriate target level for the receptor type) must be tested, at a minimum, for chemicals of concern as part of the receptor evaluation. Actual plumes refer to groundwater plumes for all chemicals of concern. Untreated or raw water must be collected for analysis unless it is determined to be infeasible or impracticable.

All existing drinking water wells and non-drinking water wells within the modeled plume or the actual plume as provided in paragraph *"a"* must be evaluated as actual receptors. Potential receptors only exist if the groundwater is a protected groundwater source. Potential receptor points of exposure are those points within the modeled plume or actual plume that exceed the potential point of exposure target level. The point(s) of compliance for actual receptor(s) is the receptor. The point(s) of compliance for potential receptor(s) is the potential receptor point of exposure as provided in 135.10(2)*"j"* and 135.10(2)*"k."*

c. Target levels. For drinking water wells, the target level at the point(s) of exposure is the Tier 1 level for actual receptors. For non-drinking water wells, the target level at the point(s) of exposure is the Tier 1levels for potential receptors. For potential receptors, the target level at the potential receptor point(s) of exposure is the Tier 1 level for potential receptors.

d. The soil leaching to groundwater pathway must be evaluated in accordance with 135.9(5) if this pathway is complete.

e. Modeling. At Tier 2, the groundwater well located within the modeled plume is assumed to be drawing from the contaminated aquifer, and the groundwater transport model is designed to predict horizontal movement to the well. If the groundwater professional determines that assessment of the vertical movement of contamination is advisable to determine the potential or actual impact to the well source, a Tier 3 assessment of this vertical pathway may be conducted. The groundwater professional shall submit a work plan to the department specifying the assessment methods and objectives for approval in accordance with 135.11(455B). Factors which should be addressed include, but are not limited to, well depth and construction, radius of influence, hydrogeologic separation of aquifer, preferential pathways, and differing water quality characteristics.

f. Public water supply well assessment. Rescinded IAB 3/11/09, effective 4/15/09.

g. Plume definition. The groundwater plume shall be defined to the applicable Tier 1 level for actual receptors except, where there are no actual receptors and the groundwater is a protected groundwater source, the plume shall be defined to the Tier 1 level for potential receptors.

h. Pathway classification. This pathway shall be classified as high risk, low risk or no action required in accordance with 135.12(455B).

i. Corrective action response. Corrective action must be conducted in accordance with 135.12(455B). Abandonment and plugging of wells in accordance with 567—Chapters 39 and 49 is an acceptable corrective action response.

j. Use of institutional controls. The use of institutional controls may be used to obtain no action required pathway classification. If the pathway is complete and the concentrations exceed the applicable Tier 1 level(s) for actual receptors, the drinking or non-drinking water well must be properly plugged in accordance with 567—Chapters 39 and 49 and the institutional control must prohibit the use of a protected groundwater source (if one exists) within the actual or modeled plume as provided in 135.10(2)*"j"* and 135.10(2)*"k."* If the Tier 1 level is exceeded for potential receptors, the institutional control must prohibit the use of a protected groundwater source within the actual or modeled plume, whichever is greater. If concentrations exceed the Tier 1 level for drinking water wells and the groundwater is a protected groundwater source, the owner or operator must provide notification of the site conditions on a department form to the department water supply section, or if a county has delegated authority, then the designated county authority responsible for issuing private water supply construction permits or regulating non-public water well construction as provided in 567—Chapters 38 and 49.

k. Notification of well owners. Upon receipt of a Tier 2 site cleanup report and as soon as practicable, the department shall notify the owner of any public water supply well identified within the Tier 2 site cleanup report that a leaking underground storage tank site is within 2,500 feet and an assessment has been performed.

135.10(5) *Soil leaching to groundwater pathway assessment.*

a. General. The soil leaching to groundwater pathway is evaluated using a one-dimensional model which predicts vertical movement of contamination through soil to groundwater and transported by the groundwater to a receptor. The model is used to predict the maximum concentrations of chemicals of concern that would be present in groundwater beneath a source which is representative of residual soil contamination and maximum soil concentrations. The predicted groundwater concentrations then must be used as a groundwater source concentration to evaluate its impact on other groundwater transport pathways, including the groundwater ingestion pathway, the groundwater vapor pathway, the groundwater ~~plastic~~ water line pathway and the surface water pathway.

b. Pathway completeness. This pathway is complete whenever a groundwater transport pathway is complete as provided in this rule.

c. Plume definition. The soil plume shall be defined to the Tier 1 levels for the soil leaching to groundwater pathway.

d. Receptor evaluation. Receptors for this pathway are the same as the receptors for each complete groundwater transport pathway.

e. Modeling and target levels. The soil and groundwater parameters shall be measured as provided in 135.10(2).

The soil leaching to groundwater model shall be used to calculate the predicted groundwater source concentration. Each applicable groundwater transport pathway model shall then be used in accordance with the rules for that pathway to predict potential impact to actual receptors, the location of potential receptor points of exposure and the site-specific target level (SSTL) in groundwater at the source. This SSTL then is used to calculate a SSTL for soil at the source. If the soil concentrations exceed the SSTL for soil, corrective action response shall be evaluated.

f. Corrective action response. If the maximum soil concentration at the source exceeds the SSTL for soil for actual or potential receptors, corrective action must be taken in accordance with 135.12(455B).

135.10(6) *Groundwater vapor to enclosed space pathway assessment.*

a. Pathway completeness. Unless cleared at Tier 1, this pathway is always considered complete

for purposes of Tier 2.

b. Explosive vapor survey. If an explosive vapor survey has not been conducted as part of a Tier 1 assessment, an explosive vapor survey of enclosed spaces must be conducted during the Tier 2 assessment in accordance with 135.9(6)*"b"* and procedures outlined in the department's Tier 1 guidance.

c. Confined space receptor evaluation. Actual and potential receptors are evaluated at Tier 2 for this pathway.

(1) Actual receptors. An existing confined space within the modeled groundwater plume or the actual groundwater plume as provided in 135.10(2)*"j"* and 135.10(2)*"k"* is an actual receptor. For the purpose of Tier 2, a confined space is a basement in a building occupied by humans. Buildings constructed with a concrete slab on grade or buildings constructed without a concrete slab, but with a crawl space are not considered confined spaces. Sanitary sewers are considered confined space receptors and preferential pathways if an occupied building exists within 200 feet of where the sewer line crosses over or through actual or modeled groundwater contamination which exceeds the target levels calculated for sewers. The sanitary sewer includes its utility envelope. The point of exposure is the receptor and points of compliance include the locations where target level measurements may be taken as provided in paragraphs *"f"* and *"g."*

(2) Potential receptors. Potential receptors are confined spaces that do not presently exist but could exist in the future. Areas within the actual groundwater plume perimeter or modeled groundwater plume perimeter are considered potential receptor points of exposure. Potential receptors are evaluated and target levels established based on the current zoning as provided in paragraph *"f."* The potential receptor point of exposure is a point of compliance.

d. Owners and operators may be required to address vapor inhalation hazards in occupied spaces other than confined spaces as defined in these rules when evidence arises which would give the department a reasonable basis to believe vapor hazards are present or may occur.

e. Plume definition.

(1) The soil plume must be defined in accordance with 135.10(2)*"f"* for the purposes of estimating source width and source length used in soil leaching to groundwater and groundwater transport models.

(2) The groundwater plume must be defined to the target levels derived from site-specific data as provided in paragraph *"f."*

f. Target levels. Target levels can be based on groundwater concentrations, soil gas measurements, and indoor vapor measurements as provided below.

(1) For actual receptors and potential receptors, groundwater modeling as provided in 135.10(2) is used to calculate the groundwater concentration target level at the point of exposure. Default residential exposure factors, default residential building parameters, and a target risk of 10^{-4} are used to determine target levels for actual receptors and potential receptor points of exposure in residential areas and areas with no zoning. Default nonresidential exposure factors, default nonresidential building parameters, and a target risk of 10^{-4} are used to determine target levels for actual receptors and potential receptor points of exposure in nonresidential areas. Default values are provided in Appendices A and B.

(2) For actual receptors, the indoor vapor target levels are designated in 135.10(7)*"f."* For actual and potential receptors, the soil gas target levels are designated in 135.10(7)*"f."*

(3) Sanitary sewers are treated as human health receptors, and groundwater concentration target levels at the point of exposure are based on the application of a target risk of 2×10^{-4} for carcinogens and a hazard quotient of 2 for noncarcinogens.

g. Pathway evaluation and classification. Upon completion of analysis of field data and modeled data, the pathway must be classified high risk, low risk or no further action as provided in 135.12(455B).

(1) Actual receptors. If it can be demonstrated that the groundwater plume has reached steady state concentrations under a confined space, indoor vapor measurements at the point(s) of exposure

and soil gas measurements at an alternative point(s) of compliance may be used for the pathway evaluation. When assessing sanitary sewers for pathway clearance, soil gas measurements may be evaluated against the soil gas target levels; however, indoor vapor cannot be used as criteria for pathway clearance. Soil gas measurements shall be taken and analyzed in accordance with 135.16(5) and the department's Tier 2 guidance, and at locations in the plume where measured groundwater concentrations exceed the levels which are projected by modeling to exist beneath the actual receptor. If measured groundwater concentrations beneath the actual receptor exceed the levels projected from modeling, then the soil gas measurements may be taken either adjacent to the actual receptor in areas expected to exhibit the greatest soil gas measurements or at an alternative point of compliance between the source and receptor where the actual groundwater concentrations exceed the groundwater concentrations which exist beneath the confined space. If the soil gas measurements and confirmation samples taken in accordance with 135.12(6)*"c"* do not exceed the soil gas target levels, the pathway as to actual receptors shall be classified no action required. If the soil gas target levels are exceeded, either the pathway shall be classified high risk, or indoor vapor measurements may be taken in accordance with the department's Tier 2 guidance. If indoor vapor measurements and confirmation samples do not exceed the indoor vapor target levels, the pathway as to actual confined space receptors shall be classified no action required. If the Tier 1 indoor vapor target levels are exceeded, the pathway shall be classified high risk.

(2) Potential receptors. If the potential receptor groundwater concentration target level(s) is exceeded at any potential receptor point of exposure based on actual data or modeling, the pathway shall be classified low risk. However, if soil gas measurements taken at the potential receptor point(s) of exposure and alternate point(s) of compliance and confirmation samples do not exceed the target levels in 135.10(7)*"f,"* the pathway, as to potential receptors, shall be classified no action required. If the target level(s) for potential sanitary sewer receptors is exceeded, the pathway shall be classified as low risk. Where the area of potential receptor exposure includes public right-of-way, the pathway may be classified as no action required if the owner or operator provides sufficient documentation to establish that there are no foreseeable plans for construction of sanitary sewers through the area of potential receptor exposure. The municipal authority must acknowledge consent to the no action required classification whenever target levels are exceeded. If the municipal authority reports that it has confirmed plans for construction of sanitary sewers through the area of potential receptor exposure, the pathway shall be reevaluated as an actual receptor.

h. Corrective action response. Unless the pathway is classified as no action required, corrective action for this pathway must be conducted as provided in 135.12(455B). Actual receptors are subject to corrective actions which: (1) reduce groundwater concentrations beneath the enclosed space to below the target level; (2) reduce the measured soil gas levels to below the soil gas target levels; (3) reduce the indoor vapor concentrations to below the indoor vapor target level; or (4) reduce the vapor level to below 10 percent of the lower explosive limit (LEL), if applicable. Potential receptors are subject to the monitoring requirements in 135.12(5). Soil vapor monitoring may be conducted in lieu of groundwater monitoring for this pathway. Institutional or technological controls as provided in 135.12(455B) may be used.

i. Municipal authority notification for potential sewer receptors. The municipal authority responsible for sewer construction must be notified of the environmental conditions whenever target level(s) is exceeded for potential sanitary sewers. The notification must show the area where groundwater concentrations and soil gas samples exceed target levels. The owner or operator must acknowledge what plans, if any, exist for construction of sanitary sewers through the area of potential receptor exposure.

135.10(7) *Soil vapor to enclosed space pathway assessment.*

a. Pathway completeness. Unless cleared at Tier 1, this pathway is always considered complete for purposes of Tier 2.

b. Explosive vapor survey. If an explosive vapor survey has not been conducted as part of a Tier 1 assessment, an explosive vapor survey of enclosed spaces must be conducted during the Tier 2

assessment in accordance with 135.9(6)*"b"* and procedures outlined in the department's Tier 1 guidance.

c. Confined space receptor evaluation. Actual and potential receptors are evaluated at Tier 2 for this pathway.

(1) Actual receptors. An existing confined space within 50 feet of the edge of the plume is an actual receptor. For the purpose of Tier 2, a confined space is a basement in a building occupied by humans. Buildings constructed with a concrete slab on grade or buildings constructed without a concrete slab, but with a crawl space are not considered receptors. Sanitary sewers are considered confined space receptors and preferential pathways if an occupied building exists within 200 feet of where the sewer line crosses over or through soil contamination which exceeds the target levels calculated for sewers. The sanitary sewer includes its utility envelope. The point of exposure is the receptor and points of compliance include the locations where target level measurements may be taken as provided in paragraphs *"f"* and *"g."*

(2) Potential receptors. Potential receptors are confined spaces that do not presently exist but could exist in the future. Areas where soil concentrations are greater than the Tier 1 level applicable to residential areas or alternative target levels for nonresidential areas as specified in paragraph *"f"* are considered potential receptor points of exposure. Potential receptors are evaluated and target levels established based on the current zoning. An area with no zoning is considered residential. The potential receptor point of exposure is a point of compliance.

d. Owners and operators may be required to address vapor inhalation hazards in occupied spaces other than confined spaces as defined in these rules when evidence arises which would give the department a reasonable basis to believe vapor hazards are present or may occur.

e. Plume definition. The soil plume must be defined to the Tier 1 level for this pathway unless vapor measurements taken at the area(s) with the maximum levels of soil contamination do not exceed the soil gas target level in 135.10(7)*"f."* If soil gas measurements taken from the area(s) of maximum soil concentration do not exceed target levels, confirmation sampling must be conducted in accordance with 135.12(6)*"c"* prior to proposing a no action pathway classification.

f. Target levels. Target levels can be based on soil concentrations, soil gas measurements, and indoor vapor measurements as provided below:

(1) For actual receptors, the soil concentration target level is the Tier 1 level. For potential receptors, the soil concentration target level for residential areas and areas with no zoning is the Tier 1 level. For areas zoned nonresidential, the target level is calculated using the default nonresidential exposure factors and building parameters from Appendix A and a target risk of 10^{-4}.

(2) The following indoor vapor target levels apply to actual receptors other than sanitary sewers and the soil gas target levels apply to all actual and potential receptors. These levels were derived from the ASTM indoor air inhalation and the soil vapor to enclosed space models designated in Appendix A.

	Indoor Vapor ($\mu g/m^3_{air}$)	**Soil Gas ($\mu g/m^3$)**
Benzene	39.2	600,000
Toluene	555	9,250,000

(3) Sanitary sewers are treated as human health receptors, and soil concentration target levels at the point of exposure are based on application of a target risk of 2×10^{-4} for carcinogens and hazard quotient of 2 for noncarcinogens.

g. Pathway evaluation and classification.

(1) Actual receptors. Confined space receptors may be evaluated using soil gas measurements and indoor vapor measurements. When assessing sanitary sewers for pathway clearance, soil gas measurements may be evaluated against the soil gas target levels, however, indoor vapor cannot be used as criteria for pathway clearance. Soil gas measurements shall be taken adjacent to the actual

receptor or at an alternative point of compliance between the source and receptor such as the property boundary, and in accordance with 135.16(5) and the department's Tier 2 guidance. If the soil gas measurements and confirmation samples taken in accordance with 135.12(6)*"c"* do not exceed the soil gas target levels, the pathway as to actual receptors shall be classified no action required. If the soil gas target levels are exceeded, either the pathway shall be classified high risk, or indoor vapor measurements may be taken in accordance with the department's Tier 2 guidance. If indoor vapor measurements and confirmation samples do not exceed the indoor vapor target levels, the pathway as to actual receptors shall be classified no action required. If the indoor vapor target levels are exceeded, the pathway shall be classified high risk.

(2) Potential receptors. If the potential receptor target level(s) based on soil concentrations is exceeded at any potential receptor point of exposure, the pathway shall be classified low risk. However, if soil gas measurements taken at the potential receptor point(s) of exposure and alternate point(s) of compliance and confirmation samples do not exceed the target levels in paragraph *"f,"* the pathway shall be classified no action required as to potential receptors. If the target level(s) for potential sanitary sewer receptors is exceeded, the pathway shall be classified as low risk. Where the area of potential receptor exposure includes public right-of-way, the pathway may be classified as no action required if the owner or operator provides sufficient documentation to establish that there are no foreseeable plans for construction of sanitary sewers through the area of potential receptor exposure. The municipal authority must acknowledge consent to the no action required classification whenever target levels are exceeded. If the municipal authority reports that it has confirmed plans for construction of sanitary sewers through the area of potential receptor exposure, the pathway shall be reevaluated as an actual receptor.

h. Corrective action response. Unless the pathway is classified as no action required, corrective action for this pathway must be conducted as provided in 135.12(455B) and in accordance with department Tier 2 guidance. Actual receptors are subject to corrective actions which: (1) reduce the indoor vapor concentrations to below the target level; (2) reduce measured soil gas levels to below the soil gas target levels; and (3) if applicable, reduce the vapor level to below 10 percent of the lower explosive limit (LEL). Potential receptors are subject to monitoring requirements as provided in 135.12(5). Soil vapor monitoring may be conducted in lieu of soil monitoring for this pathway. Institutional or technological controls as provided in 135.12(455B) may be used.

i. Municipal authority notification for potential sewer receptors. The municipal authority responsible for sewer construction must be notified of the environmental conditions whenever target level(s) is exceeded for potential sanitary sewers. The notification must show the area where soil concentrations and soil gas samples exceed target levels. The owner or operator must acknowledge what plans, if any, exist for construction of sanitary sewers through the area of potential receptor exposure.

135.10(8) *Groundwater to ~~plastic~~ water line pathway assessment.*

a. Pathway completeness and receptor evaluation.

(1) Actual receptors include all ~~plastic~~ water lines where the highest groundwater elevation is higher than three feet below the bottom of the ~~plastic~~ water line at the measured or predicted points of exposure. The highest groundwater elevation is the estimated average of the highest measured groundwater elevations for each year. All ~~plastic~~ water lines must be evaluated for this pathway regardless of distance from the source and regardless of the Tier 1 evaluation, if the lines are in areas with ~~modeled~~ actual data above the ~~SSTL~~ applicable Tier 1 level and modeled data above the SSTL line. If actual data exceeds modeled data, then all ~~plastic~~ water lines are considered actual receptors if they are within a distance extending 10 percent beyond the edge of the contaminant plume defined by the actual data.

(2) Potential receptors include all areas where the first encountered groundwater is less than 20 feet deep and where actual data or modeled data are above Tier 1 levels.

(3) The point(s) of exposure is the ~~plastic~~ water line, and the points of compliance are monitoring wells between the source and the ~~plastic~~ water line which would be effective in monitoring whether

Comment [CR4]: See previous comment about vapor issues to be covered under Vapor Intrusion group

Comment [DE5]: Keep this comment in here. Also, I disagree with previous revisions. Any lines within modeled or actual plumes must be evaluated.

Comment [CR6]: Not sure what to do with this comment.

the line has been or may be impacted by chemicals of concern.

b. Plume definition. If this pathway is complete for an actual receptor, the groundwater plume must be defined to the Tier 1 levels, with an emphasis between the source and any actual ~~plastic~~ water lines. The water inside the ~~plastic~~ water lines shall be analyzed for all chemicals of concern.

c. Target levels. Groundwater modeling as provided in 135.10(2) must be used to calculate the projected concentrations of chemicals of concern and site-specific target levels. The soil leaching to groundwater pathway must be evaluated to ensure contaminated soil will not cause future groundwater concentrations to exceed site-specific target levels. The target level at the point(s) of exposure is the Tier 1 level.

d. Pathway classification. Upon completion of analysis of field data and modeled data, the pathway must be classified high risk, low risk or no further action as provided in 135.12(455B). The water quality inside the ~~plastic~~ water lines is not a criteria for clearance of this pathway.

e. Utility company notification. The utility company which supplies water service to the area must be notified of all actual and potential ~~plastic~~ water line impacts. If the extent of contamination has been defined, this information must be included in utility company notification, and any previous notification made at Tier 1 must be amended to include this information.

f. Corrective action response.

(1) For actual receptors, unless the pathway is classified as no further action, corrective action for this pathway must be conducted as provided in 135.12(455B). If the concentrations of chemicals of concern in a water line exceed the Tier 1 levels for actual receptors for the groundwater ingestion pathway, immediate corrective action must be conducted to eliminate exposure to the water, including but not limited to replacement of the line with an approved ~~nonplastic~~ material.

(2) For potential receptors, upon utility company notification, no further action will be required for this pathway for potential receptors.

135.10(9) *Soil to ~~plastic~~ water line pathway assessment.*

a. Pathway completeness and receptor evaluation.

(1) Actual receptors include all ~~plastic~~ water lines within ten feet of the soil plume defined to the Tier 1 level. All ~~plastic~~ water lines must be evaluated for this pathway regardless of distance from the source, if the lines are in areas where Tier 1 levels are exceeded.

(2) Potential receptors include all areas where Tier 1 levels are exceeded.

b. Plume definition. The extent of soil contamination must be defined to Tier 1 levels for the chemicals of concern.

c. Target level. The point(s) of exposure include all areas within ten feet of the ~~plastic~~ water line. The target level at the point(s) of exposure is the Tier 1 level.

d. Pathway classification. Upon completion of analysis of field data ~~and modeled data~~, the pathway must be classified high risk, low risk or no further action as provided in 135.12(455B). Measurements of water quality inside the ~~plastic~~ water lines may be required, but are not allowed as criteria to clear this pathway.

e. Utility company notification. The utility company which supplies water service to the area must be notified of all actual and potential ~~plastic~~ water line impacts. If the extent of contamination has been defined, this information must be included in utility company notification, and any previous notification made at Tier 1 must be amended to include this information.

f. Corrective action response.

(1) For actual receptors, unless the pathway is classified as no further action, corrective action for this pathway must be conducted as provided in 135.12(455B).

(2) For potential receptors, upon utility company notification, no further action will be required for this pathway for potential receptors.

135.10(10) *Surface water pathway assessment.*

a. Pathway completeness. Unless maximum concentrations are less than the applicable Tier 1 levels, this pathway is complete and must be evaluated under any of the following conditions: (1) there is a designated use surface water within the modeled groundwater plume or the actual plume as

Comment [DE7]: The expectation would be that plume needs to be defined to lowest T1 level for most restrictive material (e.g., 200 ppb benzene for PE/PB/AC).

provided in 135.10(2)*"f"* and 135.10(2)*"g"*; or (2) any surface water body which failed the Tier 1 visual inspection as provided in 135.9(10).

b. Visual inspection. A visual inspection must be conducted according to 135.9(10)*"c."* If a sheen or residue from a petroleum-regulated substance is present, soil and groundwater sampling must be conducted to identify the source of the release and to define the extent of the contaminant plume to the levels acutely toxic to aquatic life as provided in 567—subrule 61.3(2).

c. Receptor evaluation.

(1) Surface water criteria apply only to designated use segments of surface water bodies as provided in 567—subrules 61.3(1) and 61.3(5). If the surface water body is a designated use segment and if maximum groundwater concentrations exceed applicable surface water criteria, the extent of contamination must be defined as provided in paragraph *"d."* The point of compliance for measuring chemicals of concern at the point of exposure is the groundwater adjacent to the surface water body because surface water must be protected for low flow conditions. In-stream measurements of concentrations are not allowed as a basis for no further action.

(2) If the visual inspection indicates the presence of a petroleum sheen in a general use segment within 200 feet of the source, as defined in 567—paragraph 61.3(1)*"a,"* the segment must be evaluated as an actual receptor. The point of compliance for measuring chemicals of concern at the point of exposure is the groundwater adjacent to the general use segment.

d. Plume definition. The groundwater plume must be defined to the surface water criteria levels for designated use segment receptors and to the acutely toxic levels for general use segment receptors, with an emphasis between the source and the surface water body.

e. Target levels. Determining target levels for this pathway involves a two-step process.

(1) Groundwater modeling as provided in 135.10(2) must be used to calculate the projected concentrations of chemicals of concern at the point of compliance. If the modeled concentrations or field data at the point of compliance exceed surface water criteria for designated use segments, an allowable discharge concentration must be calculated. If the projected concentrations and field data at the point of compliance do not exceed surface water criteria, no further action is required to assess this pathway.

(2) The department water quality section will calculate the allowable discharge concentration using information provided by the certified groundwater professional on a department form. Required information includes, at a minimum, the site location and a discharge flow rate calculated according to the department's Tier 2 guidance. The allowable discharge concentration is the target level which must be met adjacent to the surface water body which is the point of compliance.

(3) The target level at the point of exposure/compliance for general use segments subject to evaluation is the acutely toxic levels established by the department under 567—Chapter 61 and 567—subrule 62.8(2). If the modeled concentrations of field data at the point of exposure/compliance exceed the acutely toxic levels, modeling must be used to determine site classifications and corrective action in accordance with 135.12(455B).

f. Pathway classification. Upon completion of analysis of field data and modeled data, the pathway must be classified high risk, low risk or no further action as provided in 135.12(455B).

(1) For general use segments, as defined in 567—subrule 61.3(1), if the groundwater professional determines there is no sheen or residue present or if the site is not the source of the sheen or residue or if the sheen does not consist of petroleum-regulated substances, no further action is required for assessment of this pathway. If a petroleum-regulated substance sheen is present, the pathway is high risk and subject to classification in accordance with 135.12(455B).

(2) For designated use segments, as provided in 567—subrules 61.3(1) and 61.3(5), if projected concentrations of chemicals of concern and field data at the point of compliance do not exceed the target level adjacent to the surface water, and the groundwater professional determines there is no sheen or residue present, no further action is required for assessment of this pathway.

g. Corrective action response. Unless the pathway is classified as no further action, corrective action for this pathway must be conducted as provided in 135.12(455B). For surface water bodies

failing the visual inspection criteria, corrective action must eliminate the sheen and reduce concentrations to below the site specific target level in accordance with 135.12(455B).

135.10(11) *Tier 2 submission and review procedures.*

a. Owners and operators must submit a Tier 2 site cleanup report within 180 days of the date the department approves or is deemed to approve a Tier 1 assessment report under 135.9(12). If the owner or operator has elected to conduct a Tier 2 assessment instead of a Tier 1, or a Tier 2 assessment is required due to the presence of free product under 135.7(5), the Tier 2 site cleanup report must be submitted within 180 days of the date the release was confirmed. The department may establish an alternative schedule for submittal.

b. Site cleanup report completeness and accuracy. A Tier 2 site cleanup report is considered to be complete if it contains all the information and data required by this rule and the department's Tier 2 guidance. The report is considered accurate if the information and data are reasonably reliable based first on the standards in these rules and department guidance, and second, on generally accepted industry standards.

c. The certified groundwater professional responsible for completion of the Tier 2 site assessment and preparation of the report must accompany each Tier 2 site cleanup report with a certification as set out below:

I, _____, groundwater professional certification number _____, am familiar with all applicable requirements of Iowa Code section 455B.474 and all rules and procedures adopted thereunder including, but not limited to, the Department of Natural Resources' Tier 2 guidance. Based on my knowledge of those documents and the information I have prepared and reviewed regarding this site, UST registration number _____, LUST No._____, I certify that this document is complete and accurate as provided in 135.10(11) and meets the applicable requirements of the Tier 2 site cleanup report.

Signature

Date

d. Review. Unless the report proposes to classify the site as no action required, the department must approve the report within 60 days for purposes of completeness or disapprove the report upon a finding of incompleteness, inaccuracy or noncompliance with these rules. If no decision is made within this 60-day period, the report is deemed to be approved for purposes of completeness. The department retains the authority to review the report at any time a no action required site classification is proposed.

e. No action required site classification review. The department will review each Tier 2 site cleanup report which proposes to classify a site as no action required to determine the data and information are complete and accurate, the data and information comply with department rules and guidance and the site classification proposal is reasonably supported by the data and information.

f. Upon approval of the Tier 2 site cleanup report or as directed by the department, owners and operators must either implement the corrective action recommendations, including any modifications required by the department, or prepare a Tier 3 site analysis. Owners and operators must monitor, evaluate, and report the results of corrective action activities in accordance with the schedule and on a form or in a format required by the department.

g. The department may, in the interest of minimizing environmental or public health risks and promoting a more effective cleanup, require owners and operators to begin cleanup of soil and groundwater before the Tier 2 site cleanup report is approved.

h. Review of the public water supply receptor risk assessment. Rescinded IAB 3/11/09, effective 4/15/09.

[**ARC 7621B**, IAB 3/11/09, effective 4/15/09]

567—135.11(455B) Tier 3 site assessment policy and procedure.

135.11(1) *General.* Tier 3 site assessment. Unless specifically limited by rule or an imminent hazard exists, an owner or operator may choose to prepare a Tier 3 site assessment as an alternative to

completion of a Tier 2 assessment under 135.10(455B) or as an alternative to completion of a corrective action design report under 135.12(455B). Prior to conducting a Tier 3 site assessment, a groundwater professional must submit a work plan to the department for approval. The work plan must contain an evaluation of the specific site conditions which justify the use of a Tier 3 assessment, an outline of the proposed Tier 3 assessment procedures and reporting format and a method for determining a risk classification consistent with the policies underlying the risk classification system in 135.12(455B). Upon approval, the groundwater professional may implement the assessment plan and submit a report within a reasonable time designated by the department.

135.11(2) *Tier 3 site assessment.* A Tier 3 assessment may include but is not limited to the use of more site-specific or multidimensional models and assessment data, methods for calibrating Tier 2 models to make them more predictive of actual site conditions, and more extensive assessment of receptor construction and vulnerability to contaminant impacts. If use of Tier 2 models is proposed with substitution of other site-specific data (as opposed to the Tier 2 default parameters), the groundwater professional must adequately justify how site-specific data is to be measured and why it is necessary. The groundwater professional must demonstrate that the proposal has a proven applicability to underground storage tank sites or similar conditions or has a strong theoretical basis for applicability and is not biased toward underestimating assessment results. The Tier 3 assessment report shall make a recommendation for site classification as high risk, low risk or no action required, at least two corrective action response technologies and provide justification consistent with the standards and policies underlying risk classification and corrective action response under 135.12(455B) and Iowa Code chapter 455B, Division 4, Part 8.

135.11(3) *Review and submittal.* The department will review the Tier 3 assessment for compliance with the terms of the approved work plan and based on principles consistent with these rules and Iowa Code chapter 455B, Division IV, Part 8. Upon approval of the Tier 3 assessment, the department may require corrective action in accordance with 135.12(455B).

567—135.12(455B) Tier 2 and 3 site classification and corrective action response.

135.12(1) *General.* 1995 Iowa Code section 455B.474(1)*"d"*(2) provides that sites shall be classified as high risk, low risk and no action required. Risk classification is accomplished by comparing actual field data to the concentrations that are predicted by the use of models. Field data must be compared to the simulation model which uses the maximum concentrations at a source and predicts at what levels actual or potential receptors could be impacted in the future. Field data must also be compared to the site-specific target level line which assumes a target level concentration at the point of exposure and is used to predict the reduction in concentration that must be achieved at the source in order to meet the applicable target level at the point of exposure. These models not only predict concentrations at points of exposure or a point of compliance at a source but also predict a distribution of concentrations between the source and the point of exposure which may also be points of compliance. The comparison of field data with these distribution curves primarily is considered for purposes of judging whether the modeled data is reasonably predictive and what measures such as monitoring are prudent to determine the reliability of modeled data and actual field data.

For the soil vapor to enclosed pathway and soil to ~~plastic~~ water line pathways, there are no horizontal transport models to use predicting future impacts. Therefore, for these pathways, sites are classified as high risk, low risk or no action based on specified criteria below and in 135.10(455B).

135.12(2) *High risk classification.* Except as provided below, sites shall be classified as high risk if, for any pathway, any actual field data exceeds the site-specific target level line at any point for an actual receptor.

a. For the soil vapor to enclosed space and soil to ~~plastic~~ water line pathways, sites shall be classified as high risk if the target levels for actual receptors are exceeded as provided in 135.10(7) and 135.10(9).

b. For the soil vapor or groundwater vapor to enclosed space pathways, sites shall be classified as high risk if the explosivity levels at applicable points of compliance are exceeded as provided in

135.10(6) and 135.10(7).

c. Generally, sites are classified as low risk if only potential receptor points of compliance are exceeded. The following is an exception. For the soil leaching to groundwater ingestion pathway for potential receptor conditions, the site shall be classified as high risk if the groundwater concentration(s) exceeds the groundwater Tier 1 level for potential receptor and the soil concentration exceeds the soil leaching site-specific target level at the source.

135.12(3) *High risk corrective action response.*

a. Objectives. The primary objectives of corrective action in response to a high risk classification are both short- term and long-term. The short-term goal is to eliminate or reduce the risk of exposure at actual receptors which have been or are imminently threatened with exposure above target levels. The longer term goal is to prevent exposure to actual receptors which are not currently impacted or are not imminently threatened with exposure. To achieve these objectives, it is the intent of these rules that concentrations of applicable chemicals of concern be reduced by active remediation to levels below the site-specific target level line at all points between the source(s) and the point(s) of exposure as well as to undertake such interim corrective action as necessary to eliminate or prevent exposure until concentrations below the SSTL line are achieved. If it is shown that concentrations at all applicable points have been reduced to below the SSTL line, the secondary objective is to establish that the field data can be reasonably relied upon to predict future conditions at points of exposure rather than reliance on the modeled data. Reliance on field data is achieved by establishing through monitoring that concentrations within the contaminant plume are steady or declining. Use of institutional control and technological controls may be used to sever pathways or control the risk of receptor impacts.

b. For the groundwater to water line and soil to water line receptors, these objectives are achieved by active remediation, replacement, or relocation from areas within the actual plume plus some added site-specific distance to provide a safety factor to areas outside the site-specific target level line. In areas of free product, all water lines regardless of construction material must be relocated unless there is no other option and the department has approved an alternate plan of construction. If water lines and gaskets are replaced in an area of contamination, appropriate materials and construction standards following the Ten States Standard for new construction or other applicable standard in a petroleum-contaminated area and with gaskets of no less than nitrile or FKN unless otherwise approved by the department. If a service line is replaced and remains in a contaminated area, a backflow preventer shall be installed to prevent impacts to the larger water distribution system.

c.

~~*b.*~~ For ~~the~~ soil vapor ~~and soil to plastic water line~~, these objectives are achieved by active remediation of soil contamination below the target level at the point(s) of exposure or other designated point(s) of compliance using the same measurement methods for receptor evaluation under 135.10(7) and 135.10(9).

~~*c*~~*d.* For a site classified as high risk or reclassified as high risk for the soil leaching to groundwater ingestion pathway, these objectives are achieved by active remediation of soil contamination to reduce the soil concentration to below the site-specific target level at the source.

~~*d*~~*e.* A corrective action design report (CADR) must be submitted by a certified groundwater professional for all high risk sites unless the terms of a corrective action plan are formalized in a memorandum of agreement within a reasonable time frame specified by the department. The CADR must be submitted on a form provided by the department and in accordance with department CADR guidance within 60 days of site classification approval as provided in 135.10(11). The CADR must identify at least two principally applicable corrective action options designed to meet the objectives in 135.12(3), an outline of the projected timetable and critical performance benchmarks, and a specific monitoring proposal designed to verify its effectiveness and must provide sufficient supporting documentation consistent with industry standards that the technology is effective to accomplish site-specific objectives. The CADR must contain an analysis of its cost-effectiveness in relation to other options. The department will review the CADR in accordance with 135.12(9).

Comment [DE8]: I believe we agreed to this for TEH-d/wo only, not for BTEX. For BTEX, if water line replacement is the selected strategy it must include lines in the actual and modeled plume areas. Something less than the 'modeled' area would require a Tier 3- type of approach - show the plume is stable, etc.

~~e~~*f. Interim monitoring.* From the time a Tier 2 site cleanup report is submitted and until the department determines a site is classified as no action required, interim monitoring is required at least annually for all sites classified as high risk. Groundwater samples must be taken: (1) from a monitoring well at the maximum source concentration; (2) from a transition well, meaning a monitoring well with detected levels of contamination closest to the leading edge of the groundwater plume as defined to the pathway-specific target level, and between the source(s) and the point(s) of exposure; and (3) from a guard well, meaning a monitoring well between the source(s) and the point(s) of exposure with concentrations below the SSTL line. If a receptor is located within an actual plume contoured to the applicable target level for that receptor, the point of exposure must be monitored. If concentrations at the receptor already exceed the applicable target level for that receptor, corrective actions must be implemented as soon as practicable. Monitoring conducted as part of remediation or as a condition of establishing a no action required classification may be used to the extent it meets these criteria. Soil monitoring is required at least annually for all applicable pathways in accordance with 135.12(5)*"d."*All drinking water wells and non-drinking water wells within 100 feet of the largest actual plume (defined to the appropriate target level for the receptor type) must be tested annually for chemicals of concern. Actual plumes refer to groundwater plumes for all chemicals of concern.

f. Remediation monitoring. Remediation monitoring during operation of a remediation system is required at least four times each year to evaluate effectiveness of the system. A remediation monitoring schedule and plan must be specified in the corrective action design report and approved by the department.

g. Technological controls. The purpose of a technological control is to effectively sever a pathway by use of technologies such that an applicable receptor could not be exposed to chemicals of concern above an applicable target risk level. Technological controls are an acceptable corrective action response either alone or in combination with other remediation systems. The purpose of technological controls may be to control plume migration through use of containment technologies, barriers, etc., both as an interim or permanent corrective action response or to permanently sever a pathway to a receptor. Controls may also be appropriate to treat or control contamination at the point of exposure. Any technological control proposed as a permanent corrective action option without meeting the reduction in contaminant concentrations objectives must establish that the pathway to a receptor will be permanently severed or controlled. The effectiveness of a technological control must be monitored under a department approved plan until concentrations fall below the site-specific target level line or its effectiveness as a permanent response is established, and no adverse effects are created.

h. Following completion of corrective action, the site must meet exit monitoring criteria to be reclassified as no action required as specified in 135.12(6)*"b."*At any point where an institutional or technological control is implemented and approved by the department, the site may be reclassified as no action required consistent with 135.12(6).

135.12(4) *Low risk classification.* A site shall be classified as low risk if none of the pathways are high risk and if any of the pathways are low risk. A pathway shall be classified low risk if it meets one of the following conditions:

a. For actual and potential receptors, if the modeled data and the actual field data are less than the site-specific target level line, and any of the field data is greater than the simulation line.

b. For potential receptors, if any actual field data exceeds the site-specific target level line at any point.

c. For the soil leaching to groundwater ingestion pathway where modeling predicts that the Tier 1 levels for potential receptors would be exceeded in groundwater at applicable potential receptor points of compliance and the soil concentration exceeds the soil leaching to groundwater site-specific target level but groundwater concentrations are currently below the Tier 1 level for potential receptors, the site shall be initially classified as low risk and subject to monitoring under 135.12(5)*"d"*(2). If at any time during the three-year monitoring period, groundwater concentrations exceed the Tier 1 level

for potential receptors, the site shall be classified as high risk requiring soil remediation in accordance with 135.12(3)*"c."*

135.12(5) *Low risk corrective action response.*

a. Purpose. For sites or pathways classified as low risk, the purpose of monitoring is to determine if concentrations are decreasing such that reclassification to no action required may be appropriate or if the contaminant plume is stable, such that reclassification to no action required can be achieved with implementation of an institutional control per 135.12(8), or if concentrations are increasing above the site-specific target level line such that reclassification to high risk is appropriate. *or* Monitoring is necessary to evaluate impacts to actual receptors and assess the continued status of potential receptor conditions. Low risk monitoring shall be conducted and reported by a certified groundwater professional.

b. For sites or pathways classified as low risk, provide a best management practices plan with the first site monitoring report submitted after the low risk classification has been approved by the department.. The plan must include maintenance procedures, schedule of activities, prohibition of practices, and other management practices, or a combination thereof, which, after problem assessment, are determined to be the most effective means of monitoring and preventing additional contamination of the groundwater and soil. The plan will also contain a contamination monitoring proposal containing sufficient sampling points to ensure the detection of any significant movement of or increase in contaminant concentration.

c. Groundwater monitoring. For groundwater pathways, samples must be taken at a minimum of once per year: (1) from a monitoring well at the maximum source concentration; (2) a transitional well meaning a well with detected levels of contamination closest to the leading edge of the groundwater plume as defined to the pathway-specific target level and between the source and the receptor; and (3) a guard well meaning a monitoring well between the source and the point of exposure with concentrations below the SSTL line. (NOTE: Monitoring under this provision may be used to satisfy exit monitoring if it otherwise meets the criteria in 135.12(6).)

d. Soil monitoring.

(1) For the soil vapor to enclosed space pathway potential receptors, soil gas samples must be taken at a minimum of once per year in the area(s) of expected maximum vapor concentrations where an institutional control is not in place.

(2) For the soil leaching to groundwater pathway potential receptors, annual groundwater monitoring is required for a minimum of three years as provided in *"c"* above. If groundwater concentrations are below the applicable SSTL line for all three years, ~~and a final soil sample taken from the source shows no significant vertical movement~~, no further action is required. If groundwater concentrations exceed the applicable SSTL line in any of the three years, corrective action is required to reduce soil concentrations to below the Tier 1 levels for soil leaching to groundwater. Therefore, annual monitoring of soil is not applicable.

(3) For the soil to ~~plastic~~ water line pathway potential receptors, notification of the utility company is required. Notification will result in reclassification to no action required. Therefore, annual monitoring of soil is not applicable.

e. Receptors must be evaluated at least annually to ensure no actual or modeled data are above the site-specific target level line for any actual receptors. Potential receptor areas of concern must be evaluated at least annually and the presence of no actual receptors confirmed. If actual receptors are present or reasonably expected to be brought into existence, the owner or operator must report this fact to the department as soon as practicable. Annual monitoring which also meets the exit criteria under 135.12(6) may be used for that purpose.

f. The site or pathway must meet exit monitoring criteria to be reclassified as no action required as specified in 135.12(6)*"b."*If concentrations for actual receptors increase above the site-specific target level line or potential receptor status changes to actual receptor status, the site must be reclassified as high risk and further corrective action required in accordance with 135.12(3).

Comment [erd9]: I don't believe the BMP plan is being submitted typically. We may have decided early on to waive this requirement.

Comment [DE10]: The DNR accepted a policy some time ago to waive the final soil sample. We should change the rule or enforce the current rule.

Comment [DE11]: Are the rules being followed - requiring soil cleanup when the groundwater levels are increasing?

Comment [DE12]: Consider changes to this requirement if a universal / public IC tracking system is developed; and /or system for the DNR or it's contractors to do annual search for receptors.

135.12(6) *No action required classification.* A site shall be classified as no action required if all of the pathways are classified as no action required as provided below:

a. Soil pathways shall be classified as no action required if samples are less than the applicable target levels as defined for each pathway and confirmation~~al~~ sampling requirements have been met.

b. For initial classification, groundwater pathways shall be classified as no action required if the field data is below the site-specific target level line and all field data is at or less than the simulation line, and confirmation monitoring has been completed successfully. Confirmation sampling for groundwater ~~and soil~~ is a second sample which confirms the no action required criteria.

c. For reclassification from high or low risk, a pathway shall be classified as no action required if all field data is below the site-specific target level line and if exit monitoring criteria have been met, except as provided in 135.12(6)g. Exit monitoring criteria means the three most recent consecutive groundwater samples from all monitoring wells must show a steady or declining trend and the most recent samples are below the site-specific target level line. Other criteria include the following: The first of the three samples for the source well and transition well must be more than detection limits; concentrations cannot increase more than 20 percent from the first of the three samples to the third sample; concentrations cannot increase more than 20 percent of the previous sample; and samples must be separated by at least six months.

d. Confirmation sampling for soil gas and indoor vapor. For the enclosed space pathways, confirmation sampling is required to reasonably establish that the soil gas and indoor vapor samples represent the highest expected levels. A groundwater professional must obtain two samples taken at least two weeks apart. One of the samples must be taken during a seasonal period of lowest groundwater elevation and soil gas samples must be taken below the frost line.

e. Upon site classification as no action required, all groundwater monitoring wells must be properly plugged in accordance with 567—Chapters 39 and 49 unless the department requires selected wells to be maintained or written approval to maintain the well is obtained by the department.

f. Prior to acceptance of a request to classify the site 'no action required', the department may conduct or require the owner to conduct confirmation sampling of the soil, groundwater, soil gas, or indoor vapor to confirm the 'no action required' criteria have been met.

g. The department may waive, at its discretion, the exit monitoring criteria based on a certified groundwater professional's written justification to support a 'no action required' classification for the site based on a reasoned assessment of data, trends, receptor status, and corrective actions performed. One example is when steady and declining criteria have not been met due solely to variations among laboratory's lowest achievable detection limits.

135.12(7) *Reclassification.* Any site or pathway which is classified as high risk may be reclassified to low risk if in the course of corrective action the criteria for low risk classification are established. Any site or pathway which is classified as low risk may be reclassified to high risk if in the course of monitoring the conditions for high risk classification are established. Sites subject to department-approved institutional or technological controls are classified as no action required if all other criteria for no action required classification are satisfied.

135.12(8) *Use of institutional and technological controls.*

a. Purpose. The purpose of an institutional control is to restrict access to or use of property such that an applicable receptor could not be exposed to chemicals of concern for as long as the target level is exceeded at applicable points of exposure and compliance. Institutional controls include:

1. A law of the United States or the state;
2. A regulation issued pursuant to federal or state laws;
3. An ordinance or regulation of a political subdivision in which real estate subject to the institutional control is located;
4. An environmental covenant as provided in 2005 Iowa Code Supplement section 455B.474(1)*"f"*(4)(f) and in accordance with the provisions of 2005 Iowa Code Supplement chapter 455I and 567—Chapter 14;

Comment [DE13]: At some point, the department set a policy to waive the soil confirmation sample for the initial classification. The rule should be changed to reflect this.

5. Any other institutional control the owner or operator can reasonably demonstrate to the department will reduce the risk from a release throughout the period necessary to ensure that no applicable target level is likely to be exceeded.

b. Modification or termination of institutional and technological controls. At a point when the department determines that an institutional or technological control has been removed or is no longer effective for the purpose intended, regardless of the issuance of a no further action certification or previous site classification, it may require owners and operators to undertake such reevaluation of the site conditions as necessary to determine an appropriate site classification and corrective action response. If the owner or operator is in control of the affected property, the department may require reimplementation of the institutional or technological control or may require a Tier 2 assessment of the affected pathway(s) be conducted to reevaluate the site conditions and determine alternative corrective action response. An owner or operator subject to an institutional or technological control may request modification or termination of the control by conducting a Tier 2 assessment of the affected pathway or conduct such other assessment as required by the department to establish that the control is no longer required given current site conditions.

c. If the owner or operator is not in control of the affected property or cannot obtain control and the party in control refuses to continue implementation of an institutional control, the department may require the owner or operator to take such legal action as available to enforce institution of the control or may require the owner or operator to undertake a Tier 2 assessment to determine site classification and an alternative corrective action response. If a person in control of the affected property appears to be contractually obligated to maintain an institutional or technological control, the department may, but is not required to, attempt enforcement of the contractual obligation as an alternative to requiring corrective action by the owner or operator.

d. If a site is classified no action required, subject to the existence of an institutional control or technological control, the holder of the fee interest in the real estate subject to the institutional control or technological control may request, at any time, that the department terminate the institutional control or technological control requirement. The department shall terminate the requirement for an institutional control if the holder demonstrates by completion of a Tier 2 assessment of the applicable pathway or other assessment as required by the department that the site conditions warranting the control no longer exist and that the site or pathway has met exit criteria for no action required classification under 135.12(6).

135.12(9) *Corrective action design report submission and review procedures.*

a. Owners and operators must submit a corrective action design report (CADR) within 60 days of the date the department approves or is deemed to approve a Tier 2 assessment report under 135.10(11) or a Tier 3 assessment is to be conducted. The department may establish an alternative schedule for submittal. As an alternative to submitting a CADR, owners or operators may participate in a corrective action meeting process to develop a corrective action plan which would be incorporated into a memorandum of agreement or other written agreement approved by the department. Owners or operators shall implement the terms of an approved CADR, memorandum of agreement or other corrective action plan agreement.

b. Corrective action design report completeness and accuracy. A CADR is considered to be complete if it contains all the information and data required by this rule and the department's guidance. The report is considered accurate if the information and data are reasonably reliable based first on the standards in these rules and department guidance, and second, on generally accepted industry standards.

c. The certified groundwater professional responsible for completion of the CADR must provide the following certification with the CADR:

I, _____, groundwater professional certification number _____, am familiar with all applicable requirements of Iowa Code section 455B.474 and all rules and procedures adopted thereunder including, but not limited to, the Department of Natural Resources' guidance and specifications for corrective action design reports. Based on my knowledge of those documents and

Comment [DE14]: This may be where we could agree that a state-led/contract for annual receptor survey, along with a public tracking mechanism for ICs, sites & plumes, is a sufficient tool to prevent risk, or at least to notify DNR of risk (then trigger 135.12(8)b or use of NFA reopener

the information I have prepared and reviewed regarding this site, UST registration number _____, LUST No._____, I certify that this document is complete and accurate as provided in 135.12(9) and meets the applicable requirements of the corrective action design report, and that the recommended corrective action can reasonably be expected to meet its stated objectives.

Signature

Date

d. Review. Unless the report proposes to classify the site as no action required, the department must approve the report within 60 days for purposes of completeness or disapprove the report upon a finding of incompleteness, inaccuracy or noncompliance with these rules. If no decision is made within this 60-day period, the report is deemed to be approved for purposes of completeness. The department retains the authority to review the report at any time a no action required site classification is proposed. Owners or operators who fail to implement actions or meet the activity schedule in a memorandum of agreement resulting from a corrective action meeting or other written corrective action plan agreement or who fail to implement the actions or schedule outlined in an approved CADR are subject to legal action.

e. No action required site classification review. The department will review each CADR which proposes to classify a site as no action required to determine the data and information are complete and accurate, the data and information comply with department rules and guidance and the site classification proposal is reasonably supported by the data and information.

135.12(10) *Monitoring certificates and no further action certificates.*

a. Monitoring certificate. The department of natural resources will issue a monitoring certificate to the owner or operator of an underground storage tank from which a release has occurred, the current property owner, or other responsible party who has undertaken the corrective action warranting issuance of the certificate. Sites classified as low risk or sites classified as high risk/monitoring shall be eligible for a monitoring certificate. The monitoring certificate will be valid until the site is reclassified to a high risk requiring active remediation or no action required site. A site which has been issued a monitoring certificate shall not be eligible to receive a certificate evidencing completion of remediation until the site is reclassified as no action required. The monitoring certificate will be invalidated and the site reclassified to high risk if it is determined by the department that the owner of the site is not in compliance with the requirements specified in the monitoring certificate.

b. No further action certificate. The department will issue a no further action certificate to an owner or operator of an underground storage tank from which a release has occurred, the current property owner or other responsible party who has undertaken the corrective action warranting classification of the site as no action required. The person requesting the certificate shall provide the department with an accurate legal description of the property on which the underground storage tanks are or were formerly located. The following conditions apply:

(1) The site has been determined by a certified groundwater professional to not present an unreasonable risk to the public health and safety or the environment;

(2) A person issued the certificate or a subsequent purchaser of the site cannot be required to perform further corrective action solely because action standards are changed at a later date. Action standards refer to applicable site-specific standards under this rule;

(3) The certificate shall not prevent the department from ordering remediation of a new release or a release of a regulated substance from an unregulated tank;

(4) The certificate will not constitute a warranty of any kind to any person as to the condition, marketability or value of the described property;

(5) The certificate shall reflect any institutional control utilized to ensure compliance with any applicable Tier 2 level; and may include a notation that the classification is based on the fact that designated potential receptors are not in existence;

(6) The certificate shall be in a form which is recordable in accordance with Iowa Code section 558.1 et seq. and substantially in the form as provided in Appendix C.

c. The department shall modify any issued no further action certificates containing institutional controls once the owner, operator or their successor or assign has demonstrated that the institutional control is no longer necessary to meet the applicable Tier 2 level as provided in 135.12(10).

135.12(11) *Expedited corrective action.* An owner, operator or responsible party of a site at which a release of regulated substance is suspected to have occurred may carry out corrective actions at the site so long as the department receives notice of the expedited cleanup activities within 30 calendar days of their commencement; the owner, operator, or responsible party complies with the provisions of these rules; and the corrective action does not include active treatment of groundwater other than:

a. As previously approved by the department; or

b. Free product recovery pursuant to subrule 135.7(5).

c. Soil excavation. When undertaking excavation of contaminated soils, adequate field screening methods must be used to identify maximum concentrations during excavation. At a minimum one soil sample must be taken for field screening every 100 square feet of the base and each sidewall. Soil samples must be taken for laboratory analysis at least every 400 square feet of the base and each sidewall of the excavated area to confirm remaining concentrations are below Tier 1 levels. If the excavation is less than 400 square feet, a minimum of one sample must be analyzed for each sidewall and the base. The owner or operator must maintain adequate records of the excavation area to document compliance with this procedure unless submitted to the department and must provide it to the department upon request.

567—135.13(455B) Public participation.

135.13(1) For each confirmed release that is classified as high or low risk, the department must provide notice to the public by means designated to reach those members of the public directly affected by the release and the recommended corrective action response. This notice may include, but is not limited to, public notice in local newspapers, block advertisements, public service announcements, publication in a state register, letters to individual households, or personal contacts by the staff.

135.13(2) The department must ensure site release information and decisions concerning the Tier 1 assessment report, Tier 2 and Tier 3 site cleanup reports are made available to the public for inspection upon request.

135.13(3) Before approving the Tier 2 or Tier 3 site cleanup report, the department may hold a public meeting to consider comments on the proposed corrective action response if there is sufficient public interest, or for any other reason.

135.13(4) The department must give a public notice that complies with subrule 135.13(1) above if the implementation of the approved Tier 2 or Tier 3 site cleanup report does not achieve the established cleanup levels in the report and the termination of that report is under consideration by the department.

567—135.14(455B) Action levels. The following corrective action levels apply to petroleum regulated substances as regulated by this chapter. These action levels shall be used to determine if further corrective action under 135.6(455B) through 135.12(455B) or 135.15(455B) is required as the result of tank closure sampling under 135.15(3) or other analytical results submitted to the department. The contaminant concentrations must be determined by laboratory analysis as stated in 135.16(455B). Final cleanup determination is not limited to these contaminants. The contamination corrective action levels are:

	Soil (mg/kg)	**Groundwater (ug/L)**
Benzene	0.54	5
Toluene	~~42~~3.25	1,000

Ethylbenzene	15	700
Xylenes	~~No limit~~79	10,000
Total Extractable Hydrocarbons	3,800	1,200

567—135.16(455B) Laboratory analytical methods for petroleum contamination of soil and water.

Comment [DE15]: do we want to specify a method for analysis of SVOCs and VOCs?

135.16(1) *General.* When having soil or water analyzed for petroleum or hazardous substances, owners and operators of UST systems must use a laboratory certified under 567—Chapter 83. In addition they must ensure that all soil and groundwater samples are properly preserved and shipped within 72 hours of collection to a laboratory certified under 567—Chapter 83, for UST petroleum analyses. This rule provides acceptable analytical procedures for petroleum substances and required information that must be provided in all laboratory reports.

135.16(2) *Laboratory report.* All laboratory reports must contain the following information:

a. Laboratory name, address, telephone number and Iowa laboratory certification number. If analytical work is subcontracted to another laboratory, the analytical report from the certified lab which analyzed the sample must be submitted and include the information required in this subrule.

b. Medium sampled (soil, water).

c. Client submitting sample (name, address, telephone number).

d. Sample collector (name, telephone number).

e. UST site address.

f. Clients sample location identifier.

g. Date sample was collected.

h. Date sample was received at laboratory.

i. Date sample was analyzed.

j. Results of analyses and units of measure.

k. Detection limits.

l. Methods used in sample analyses (preparation method, sample detection method, and quantitative method).

m. Laboratory sample number.

n. Analyst name.

o. Signature of analyst's supervisor.

p. Condition in which the sample was received at the laboratory and whether it was properly sealed and preserved.

q. Note that analytical results are questionable if a sample exceeded an established holding time or was improperly preserved. (The recommended holding time for properly cooled and sealed petroleum contaminated samples is 14 days, except for water samples containing volatile organic compounds which have a 7-day holding time unless acid-preserved.)

r. Laboratory reports required by this chapter for tank closure investigations under 135.15(455B) and site checks under 135.6(3) or Tier 1 or Tier 2 assessments under 135.9(455B) to 135.11(455B) must include a copy of the chromatograms and associated quantitation reports for the waste oil, diesel and gasoline standard used by the laboratory in analyzing submitted samples. The laboratory analytical report for each sample must state whether the sample tested matches the laboratory standard for waste oil, diesel or gasoline or that the sample cannot be reliably matched with any of these standards. A copy of the chromatograms and associated quantitation reports for only the soil and groundwater samples with the maximum concentrations of BTEX and TEH must be included.

135.16(3) *Analysis of soil and water for high volatile petroleum compounds (i.e., gasoline, benzene, ethylbenzene, toluene, xylene).* Sample preparation and analysis shall be by Method OA-1, "Method for Determination of Volatile Petroleum Hydrocarbons (gasoline)," revision 7/27/93,

University Hygienic Laboratory, Iowa City, Iowa. This method is based on U.S. EPA methods 5030, 8000, and 8015, SW-846, "Test Methods for Evaluating Solid Waste," 3rd Edition. Copies of Method OA-1 are available from the department.

135.16(4) *Analysis of soil and water for low volatile petroleum hydrocarbon contamination (i.e., all grades of diesel fuel, fuel oil, kerosene, oil, and mineral spirits).* Sample preparation and analysis shall be by Method OA-2, "Determination of Extractable Petroleum Products (and Related Low Volatility Organic Compounds)," revision 7/27/93, University Hygienic Laboratory, Iowa City, Iowa. This method is based on U.S. EPA methods 3500, 3510, 3520, 3540, 3550, 8000, and 8100, SW-846, "Test Methods for Evaluating Solid Waste," 3rd Edition. Copies of Method OA-2 are available from the department.

135.16(5) *Analysis of soil gas for volatile petroleum hydrocarbons.* Analysis of soil gas for volatile petroleum hydrocarbons shall be conducted in accordance with the National Institute for Occupational Safety and Health (NIOSH) Method 1501, or a department-approved equivalent method.

567—135.18(455B) Transitional rules.

135.18(1) *Transitional rules.* Guidance for implementing these transitional rules is contained in the department's guidance entitled "Transition Policy Statement" dated June 6, 1996.

135.18(2) *Site cleanup reports and corrective action design reports accepted before August 15, 1996.* Any owner or operator who had a site cleanup report or corrective action design report approved by the department before August 15, 1996, may elect to submit a Tier 1 Site Assessment or Tier 2 Site Cleanup Report to the department. If the owner, operator, or responsible party so elects, the site shall be assessed, classified, and, if necessary, remediated, in accordance with the rules of the department as of August 15, 1996. To the extent that data collected for the site cleanup report does not include all information necessary for the Tier 1 Site Assessment or Tier 2 Site Cleanup Report, the owner or operator shall utilize the default parameters set out in subrule 135.18(4) or provide site-specific parameters.

135.18(3) *Site cleanup reports in the process of preparation or review prior to August 15, 1996.* The department will complete a Tier 1 or a Tier 2 risk analysis for any site cleanup report received but not approved by the department by November 15, 1996. To the extent that data collected for the site cleanup report does not include all information necessary for the Tier 2 site cleanup report and the owner or operator elects to not complete a Tier 2 site cleanup report the department shall utilize the default parameters set out in subrule 135.18(4). If the owner or operator wishes that site-specific data, rather than any default parameter, be used, the owner or operator shall notify the department by October 15, 1996, or in accordance with a schedule specified by the department. Following notification, the owner or operator shall be responsible for preparation of the Tier 1 site assessment or Tier 2 site cleanup report.

135.18(4) *Default parameters for use in converting a site cleanup report to a Tier 2 site cleanup report.*

a. As to sites for which the owner or operator has collected and submitted only TPH ("total petroleum hydrocarbons") data regarding soil contamination, TPH levels shall be converted to a risk associated factor by using: (1) previously acquired data regarding benzene, toluene, ethyl benzene, and xylenes data for the samples; (2) newly collected benzene, toluene, ethylbenzene, and xylenes data for the site; or (3) the assumptions that 1 percent of the total petroleum hydrocarbon (TPH) is benzene, 7 percent of the TPH is toluene, 2 percent of the TPH is ethylbenzene, and 8 percent of the TPH is xylenes.

b. As to sites for which the owner or operator has, to date, submitted only TEH ("total extractable hydrocarbons") data regarding soil contamination, TEH levels should be converted to a risk-associated factor by using: (1) previously acquired benzene, toluene, ethylbenzene and xylenes data for the samples; (2) newly collected benzene, toluene, ethylbenzene and xylenes data for the site; or (3) the assumption that 0.004 percent of the TEH is benzene, 0.05 percent of the TEH is toluene,

0.03 percent of the TEH is ethylbenzene and 0.3 percent of the TEH is xylenes. In addition, TEH levels should be compared to the TEH default levels in the Tier 1 Table. If, as of August 15, 1996, only TEH data for soil is available, and it does not exceed Tier 1 levels, additional sampling for TEH in groundwater is not required. Otherwise, groundwater samples must be collected and analyzed for TEH in accordance with 135.8(3).

c. Data required for preparing a Tier 2 site cleanup report shall be taken from the site cleanup report. If the site cleanup report lacks any of the data, site-specific data subsequently obtained may be used. The following assumptions shall be used if no site cleanup report or site-specific data is provided:

(1) If the site cleanup report is unclear as to neighboring land use, assume the land residential land use;

(2) Use the larger resulting default if both TPH and TEH data are available.

(3) For sites with free product gasoline range constituents, the default values in groundwater are 17,500 ug/l for benzene, 3,040 ug/l for ethylbenzene, 37,450 ug/l for toluene and 15,840 ug/l for xylenes. For sites with free product consisting of diesel range constituents, the default values are 370 ug/l benzene, 640 ug/l toluene, 140 ug/l ethylbenzene, 580 ug/l xylenes, and 260 ug/l naphthalene or 130,000 ug/l TEH.

135.18(5) *Risk-based corrective action assessment reports, corrective action plans, and corrective action design reports accepted before August 6, 2008.* Any owner or operator who had a Tier 2 site cleanup report, Tier 3 report, or corrective action design report approved by the department before August 6, 2008, may elect to submit a Tier 2 site cleanup report using the Appendix B revised model, department-developed software and rules in effect as of August 6, 2008. The owner or operator shall notify the department that the owner or operator wishes to evaluate the leaking underground storage tank site with the Appendix B revised model, software and rules. If the owner or operator so elects, the site shall be assessed, classified, and, if necessary, remediated, in accordance with the rules of the department as of August 6, 2008. If the leaking underground storage tank site is undergoing active remediation, the remediation system shall remain operating until the reevaluation is completed and accepted or as otherwise approved by the department. Once a site has been evaluated using the Appendix B revised model, software and rules in effect as of August 6, 2008, it can no longer be evaluated with the Appendix B-1 old model and software and rules in effect prior to August 6, 2008.

135.18(6) *Risk-based corrective action assessment reports, corrective action plans, and corrective action design reports in the process of preparation with a submittal schedule established prior to August 6, 2008.* The owner or operator shall notify the department that the owner or operator wishes to use the Appendix B revised model and department software and rules in effect as of August 6, 2008, to evaluate the leaking underground storage tank site before submitting the next report, and prior to expiration of the previously established submittal schedule. Once a site has been evaluated using the Appendix B revised model, software and rules in effect as of August 6, 2008, it can no longer be evaluated with the Appendix B-1 old model, software and rules existing just prior to August 6, 2008.

135.18(7) *Risk-based corrective action assessment reports, corrective action plans, and corrective action design reports received by the department but not yet reviewed.* The owner or operator will notify the department within 60 days of August 6, 2008, whether the owner or operator is electing to complete a risk-based corrective action assessment using Appendix B revised model, department software and rules effective as of August 6, 2008, or proceeding with the risk-based corrective action assessment using Appendix B-1 old model and department software and rules existing prior to August 6, 2008. Once a site has been evaluated using the Appendix B revised model, software and rules it can no longer be evaluated with the previous Appendix B-1 old model, software and rules.

567—135.19(455B) Analyzing for methyl tertiary-butyl ether (MTBE) in soil and groundwater samples.

135.19(1) *General.* The objective of analyzing for MTBE is to determine its presence in soil and water samples collected as part of investigation and remediation of contamination at underground

storage tank facilities.

135.19(2) *Required MTBE testing.* Soil and water samples must be analyzed for MTBE when collected for risk-based corrective action as required in rules 135.8(455B) through 135.12(455B). These sampling requirements include but are not limited to:

a. Risk-based corrective action (RBCA) evaluations required for Tier 1, Tier 2, and Tier 3 assessments and corrective action design reports.

b. Site monitoring.

c. Site remediation monitoring.

135.19(3) *MTBE testing not required.* Soil and water samples for the following actions are not required to be analyzed for MTBE:

a. Closure sampling under rule 135.15(455B) unless Tier 1 or Tier 2 sampling is being performed.

b. Site checks under subrule 135.7(3) unless Tier 1 or Tier 2 sampling is being performed.

c. If prior analysis at a site under 135.19(2) has not shown MTBE present in soil or groundwater.

d. If the department determines MTBE analysis is no longer needed at a site.

135.19(4) *Reporting.* The analytical data must be submitted in a format prescribed by the department.

135.19(5) *Analytical methods for methyl tertiary-butyl ether (MTBE).* When having soil or water analyzed for MTBE from contamination caused by petroleum or hazardous substances, owners and operators of UST systems must use a laboratory certified under 567—Chapter 83 for petroleum analyses. In addition, the owners and operators must ensure all soil and water samples are properly preserved and shipped within 72 hours of collection to a laboratory certified under 567—Chapter 83 for petroleum analyses.

a. Sample preparation and analysis shall be by:

(1) GC/MS version of OA-1, "Method for Determination of Volatile Petroleum Hydrocarbons (gasoline)," revision 7/27/93, University Hygienic Laboratory, Iowa City, Iowa; or

(2) U.S. Environmental Protection Agency Method 8260B, SW-846, "Test Methods for Evaluating Solid Waste," Third Edition.

b. Laboratories performing the analyses must run standards for MTBE on a routine basis, and standards for other possible compounds like ethyl tertiary-butyl ether (ETBE), tertiary-amyl methyl ether (TAME), diisopropyl ether (DIPE), and tertiary-butyl alcohol (TBA) to be certain of their identification should they be detected.

c. Laboratories must run a method detection limit study and an initial demonstration of capability for MTBE. These records must be kept on file.

d. The minimum detection level for MTBE in soil is 15 ug/kg. The minimum detection level for MTBE in water is 15 ug/l.

]

Appendix A - Tier 1 Table, Assumptions, Equations and Parameter Values

Iowa Tier 1 Look-Up Table

Iowa Tier 1 Look-Up Table

Media	Exposure Pathway	Receptor	Group 1				Group 2: TEH	
			Benzene	Toluene	Ethylbenzene	Xylenes	Diesel*	Waste Oil
Groundwater (µg/L)	Groundwater Ingestion	Actual	5	1,000	700	10,000	1,200	400
		Potential	290	7,300	3,700	73,000	75,000	40,000
	Groundwater Vapor to Enclosed Space	All	1,540	20,190	46,000	NA	2,200,000	NA
	Groundwater to Water Line	Mains	7,500	6,250	22,950	71,250	75,000	40,000
		Service Lines	3,750	3,125	11,475	35,625	75,000	40,000
		PE/PB/AC	200	3,125	3,400	19,000	75,000	40,000
	Surface Water	All	290	1,000	3,700	73,000	75,000	40,000
Soil	Soil Leaching to Groundwater	All	0.54	42	15	NA	3,800	NA
	Soil Vapor to Enclosed Space	All	1.16	48	79	NA	47,500	NA
	Soil to Water Line	All	2.0	3.25	26	79	10,500	NA

~~Media~~	~~Exposure Pathway~~	~~Receptor~~	~~Group 1~~				~~Group 2: TEH~~	
			~~Benzene~~	~~Toluene~~	~~Ethylbenzene~~	~~Xylenes~~	~~Diesel*~~	~~Waste Oil~~
~~Groundwater (ug/L)~~	~~Groundwater Ingestion~~	~~actual~~	~~5~~	~~1,000~~	~~700~~	~~10,000~~	~~1,200~~	~~400~~
		~~potential~~	~~290~~	~~7,300~~	~~3,700~~	~~73,000~~	~~75,000~~	~~40,000~~
	~~Groundwater Vapor to Enclosed Space~~	~~all~~	~~1,540~~	~~20,190~~	~~46,000~~	~~NA~~	~~2,200,000~~	~~NA~~
	~~Groundwater to Plastic Water Line~~	~~all~~	~~290~~	~~7,300~~	~~3,700~~	~~73,000~~	~~75,000~~	~~40,000~~
	~~Surface Water~~	~~all~~	~~290~~	~~1,000~~	~~3,700~~	~~73,000~~	~~75,000~~	~~40,000~~
~~Soil (mg/kg)~~	~~Soil Leaching to Groundwater~~	~~all~~	~~0.54~~	~~42~~	~~15~~	~~NA~~	~~3,800~~	~~NA~~
	~~Soil Vapor to Enclosed Space~~	~~all~~	~~1.16~~	~~48~~	~~79~~	~~NA~~	~~47,500~~	~~NA~~
	~~Soil to Plastic Water Line~~	~~all~~	~~1.8~~	~~120~~	~~43~~	~~NA~~	~~10,500~~	~~NA~~

NA: Not applicable. There are no limits for the chemical for the pathway, because for groundwater pathways the concentration for the designated risk would be greater than the solubility of the pure chemical in water, and for soil pathways the concentration for the designated risk would be greater than the soil concentration if pure chemical were present in the soil.

TEH: Total Extractable Hydrocarbons. The TEH value is based on risks from naphthalene, benzo(a)pyrene, benz(a)anthracene, and chrysene. Refer to Appendix B for further details.

Diesel*: Standards in the Diesel column apply to all low volatile petroleum hydorcarbons except waste oil.

Assumptions Used for Iowa Tier 1 Look-Up Table Generation

1. Groundwater ingestion pathway. The maximum contaminant levels (MCLs) were used for Group 1 chemicals. The target risk for carcinogens for actual receptors is 10-6 and for potential receptors is 10-4. A hazard quotient of one, and residential exposure and building parameters are assumed.

2. Groundwater vapor to enclosed space pathway. Residential exposure and residential building parameters are assumed; no inhalation reference dose is used for benzene; the capillary fringe is assumed to be the source of groundwater vapor; and the hazard quotient is 1 and target risk for carcinogens is 1x10-4.

3. Groundwater to ~~plastic~~ water line. This pathway uses the same assumptions as the groundwater ingestion pathway for potential receptors,

including a target risk for carcinogens of 10-4.

4. Surface water. This pathway uses the same assumptions as the groundwater ingestion pathway for potential receptors, including a target risk for carcinogens of 10-4, except for toluene which has a chronic level for aquatic life of 1,000 as in the definition for surface water criteria in 567—135.2.

5. Soil leaching to groundwater. This pathway assumes the groundwater will be protected to the same levels as the groundwater ingestion pathway for potential receptors, using residential exposure and a target risk for carcinogens of 10-4.

6. Soil vapor to enclosed space pathway. The target risk for carcinogens is 1x10-4; the hazard quotient is 1; no inhalation reference dose is used for benzene; residential exposure factors are assumed; and the average of the residential and nonresidential building parameters are assumed.

7. Soil to ~~plastic~~ water line pathway. This pathway uses the soil leaching to groundwater model with nonresidential exposure and a target risk for carcinogens of 10-4

In addition to these assumptions, the equations and parameter values used to generate the Iowa Tier 1 Look-Up Table are described below.

Groundwater Ingestion Equations

Carcinogens:

$$RBSL_w \left[\frac{mg}{L - H_2O}\right] = \frac{TR \times BW \times AT_c \times \frac{365\ days}{year}}{SF_o \times IR_w \times EF \times ED}$$

Noncarcinogens:

$$RBSL_w \left[\frac{mg}{L - H_2O}\right] = \frac{THQ \times RfD_o \times BW \times AT_n \times \frac{365\ days}{year}}{IR_w \times EF \times ED}$$

Soil Leaching to Groundwater Equations

$$RBSL_{soil}\left[\frac{mg}{kg - soil}\right] = \frac{RBSL_w\left[\frac{mg}{L - H_2O}\right]}{LF}$$

$$LF\left[\frac{mg/L - H_2O}{mg/kg - soil}\right] = \frac{\rho_s}{(\theta_{aws} + k_s\rho_s + H\theta_{ans})\left(1 + \frac{Uδ}{IW}\right)}$$

Soil Vapor to Enclosed Space Equations

$$RBSL_{sv}\left[\frac{mg}{kg - soil}\right] = \frac{RBSL_{air}\left[\frac{\mu g}{m^3 - air}\right]}{VF_{sv}}\left(\frac{mg}{1000\ \mu g}\right)$$

$$VF_{sv}\left[\frac{(mg/m^3 - air)}{(mg/kg - soil)}\right] = \frac{\frac{H\rho_s}{(\theta_{ws} + k_s\rho_s + H\theta_{as})}\left[\frac{D_s^{eff}/L_s}{ER\ L_B}\right]}{1 + \left[\frac{D_s^{eff}/L_s}{ER\ L_B}\right] + \left[\frac{D_s^{eff}/L_s}{(D_{crack}^{eff}/L_{crack})\eta}\right]}\left(10^3\ \frac{cm^3 - kg}{m^3 - g}\right)$$

$$D_{crack}^{eff}\left[\frac{cm^2}{s}\right] = D^{air}\frac{\theta_{acrack}^{3.33}}{\theta_T^2} + D^{wat}\frac{1}{H}\frac{\theta_{wcrack}^{3.33}}{\theta_T^2}$$

$$D_s^{eff}\left[\frac{cm^2}{s}\right] = D^{air}\frac{\theta_{as}^{3.33}}{\theta_T^2} + D^{wat}\frac{1}{H}\frac{\theta_{ws}^{3.33}}{\theta_T^2}$$

Indoor Air Inhalation Equations

Carcinogens:

$$RBSL_{air}\left(\frac{\mu g}{m^3 - air}\right) = \frac{TR \times BW \times AT_c \times 365\ \frac{days}{year}}{SF_i \times IR_{air} \times EF \times ED} \times 1000\ \mu g/mg$$

Noncarcinogens:

$$RBSL_{air}\left(\frac{\mu g}{m^3 - air}\right) = \frac{THQ \times RfD_i \times BW \times AT_n \times 365\ \frac{kdays}{year}}{} \times 1000\ \mu g/mg$$

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$$\frac{m^3\text{-air}}{IR_{air} \times EF \times ED}$$

Groundwater Vapor to Enclosed Space Equations

$$RBSL_{gw}\left[\frac{mg}{L-H_2O}\right] = \frac{RBSL_{air}\left[\frac{\mu g}{m^3-air}\right]}{VF_{gw}}\left(\frac{mg}{1000\ \mu g}\right)$$

$$VF_{gw}\left[\frac{(mg/m^3-air)}{(mg/L-H_2O)}\right] = \frac{H\left[\frac{D_s^{eff}/L_{gw}}{ER\ L_B}\right]}{1+\left[\frac{D_s^{eff}/L_{gw}}{ER\ L_B}\right]+\left[\frac{D_s^{eff}/L_{gw}}{\left(D_{crack}^{eff}/L_{crack}\right)\eta}\right]}\left(\frac{10^3 L}{m^3}\right)$$

Variable Definitions

δ	groundwater mixing zone thickness (cm)
η	areal fraction of cracks in foundation/wall (cm^2-cracks/cm^2-area)
ρ_s	soil bulk density (g/cm^3)
θ_{acrack}	volumetric air content in foundation/wall cracks (cm^3-air/cm^3-soil)
θ_{as}	volumetric air content in vadose zone (cm^3-air/cm^3-soil)
θ_T	total soil porosity (cm^3-voids/cm^3-soil)
θ_{wcrack}	volumetric water content in foundation/wall cracks (cm^3-H_2O/cm^3-soil)
θ_{ws}	volumetric water content in vadose zone (cm^3-H_2O/cm^3-soil)
AT_c	averaging time for carcinogens (years)
AT_n	averaging time for noncarcinogens (years)
BW	body weight (kg)
D^{air}	chemical diffusion coefficient in air (cm^2/s)
D^{wat}	chemical diffusion coefficient in water (cm^2/s)
D^{eff}_{crack}	effective diffusion coefficient through foundation cracks (cm^2/s)
D^{eff}_{s}	effective diffusion coefficient in soil based on vapor-phase concentration (cm^2/s)
ED	exposure duration (years)
EF	exposure frequency (days/year)
ER	enclosed space air exchange rate (s^{-1})
f_{oc}	fraction organic carbon in the soil (kg-C/kg-soil)
H	henry's law constant (L-H_2O)/(L-air)
i	groundwater head gradient (cm/cm)
I	infiltration rate of water through soil (cm/year)
IR_{air}	daily indoor inhalation rate (m^3/day)
IR_w	daily water ingestion rate (L/day)
K	hydraulic conductivity (cm/year)
K_{oc}	carbon-water sorption coefficient (L-H_2O/kg-C)
k_s	soil-water sorption coefficient (L-H_2O/kg-soil), f_{oc} x K_{oc}
L_B	enclosed space volume/infiltration area ratio (cm)
L_{crack}	enclosed space foundation or wall thickness (cm)
LF	leaching factor from soil to groundwater ((mg/L-H_2O)/(mg/kg-soil))
L_{gw}	depth to groundwater from the enclosed space foundation (cm)
L_s	depth to subsurface soil sources from the enclosed space foundation (cm)
$RBSL_{air}$	Risk-Based Screening Level for indoor air ($\mu g/m^3$-air)
$RBSL_{gw}$	Risk-Based Screening Level for vapor from groundwater to enclosed space air inhalation (mg/L-H_2O)
$RBSL_{sl}$	Risk-Based Screening Level for soil leaching to groundwater (mg/kg-soil)
$RBSLs_v$	Risk-Based Screening Level for vapors from soil to enclosed space air inhalation (mg/kg-soil)

$RBSL_w$	Risk-Based Screening Level for groundwater ingestion (mg/L-H_2O)
RfD_i	inhalation chronic reference dose ((mg/(kg-day))
RfD_o	oral chronic reference dose ((mg/(kg-day))
SF_i	inhalation cancer slope factor ((kg-day)/mg)
SF_o	oral cancer slope factor ((kg-day)/mg)
THQ	target hazard quotient for individual constituents (unitless)
TR	target excess individual lifetime cancer risk (unitless)
U	groundwater Darcy velocity (cm/year), U=Ki
VF_{gw}	volatilization factor for vapors from groundwater to enclosed space ((mg/m^3-air)/(mg/L-H_2O))
VF_{sv}	volatilization factor for vapors from soil to enclosed space ((mg/m^3-air)/(mg/kg-soil))
W	width of soil source area parallel to groundwater flow direction (cm)

Soil and Groundwater Parameter Values Used for Iowa Tier 1 Table Generation

Parameter		Iowa Tier 1 Table Value
K	hydraulic conductivity	16060 cm/year
i	groundwater head gradient	0.01 cm/cm
W	width of soil source area parallel to groundwater flow direction	1500 cm
I	infiltration rate of water through soil	7 cm/year
δ	groundwater mixing zone thickness	200 cm
ρ_s	soil bulk density	1.86 g/cm^3
θ_{as}	volumetric air content in vadose zone	0.2 cm^3-air/cm^3-soil
θ_{ws}	volumetric water content in vadose zone	0.1 cm^3-H_2O/cm^3-soil
θ_{acrack}	volumetric air content in foundation/wall cracks	0.2 cm^3-air/cm^3-soil
θ_{wcrack}	volumetric water content in foundation/wall cracks	0.1 cm^3-H_2O/cm^3-soil
θ_T	total soil porosity	0.3 cm^3-voids/cm^3-soil
f_{oc}	fraction organic carbon in the soil	0.01 kg-C/kg-soil
L_s	depth to subsurface soil sources from the enclosed space foundation	1 cm
L_{gw}	depth to groundwater from the enclosed space foundation	1 cm

Exposure Factors Used in Iowa Tier 1 Table Generation

Parameter		Residential	Nonresidential
AT_c (years)	averaging time for carcinogens	70	70
AT_n (years)	averaging time for noncarcinogens	30	25
BW (kg)	body weight	70	70
ED (years)	exposure duration	30	25
EF (days/year)	exposure frequency	350	250
IR_{air} (m^3/day)	daily indoor inhalation rate	15	20
IR_w (L/day)	daily water ingestion rate	2	1
THQ (unitless)	target hazard quotient for individual constituents	1.0	1.0

Building Parameters Used in Iowa Tier 1 Table Generation

Parameter		Residential	Nonresidential
ER (s^{-1})	enclosed space air exchange rate	0.00014	0.00023
L_B (cm)	enclosed space volume/infiltration area ratio	200	300
L_{crack} (cm)	enclosed space foundation or wall thickness	15	15
η	areal fraction of cracks in foundation/wall	0.01	0.01

Chemical-Specific Parameter Values Used for Iowa Tier 1 Table Generation

Chemical	D^{air} (cm^2/s)	D^{wat} (cm^2/s)	H (L-air/L-water)	log(K_{oc}), L/kg
Benzene	0.093	1.1e-5	0.22	1.58
Toluene	0.085	9.4e-6	0.26	2.13
Ethylbenzene	0.076	8.5e-6	0.32	1.98
Xylenes	0.072	8.5e-6	0.29	2.38
Naphthalene	0.072	9.4e-6	0.049	3.11
Benzo(a)pyrene	0.050	5.8e-6	5.8e-8	5.59
Benz(a)anthracene	0.05	9.0e-6	5.74e-7	6.14
Chrysene	0.025	6.2e-6	4.9e-7	5.30

Saturation Values Used to Determine "NA" for the Iowa Tier 1 Table

Chemical	Solubility in Water (mg/L) S	Saturation in Soil (mg/kg) C_s^{sat}
Benzene	1,750	801
Toluene	535	765
Ethylbenzene	152	159
Xylenes	198	492
Naphthalene	31	401
Benzo(a)pyrene	0.0012	4.69
Benz(a)anthracene	0.014	193.3
Chrysene	0.0028	5.59

The maximum solubility of the pure chemical in water is listed in the table above. The equation below is used to calculate the soil concentration (Cssat) at which dissolved pore-water and vapor phases become saturated. Tier 1 default values are used in the equation. "NA" (for not applicable) is used in the Tier 1 table when the risk-based value exceeds maximum solubility for water (S) or maximum saturation for soil (Cssat).

$$C_s^{sat}(mg/kg\text{-}soil) = S/\rho_s \times (H\theta_{as} + \theta_{ws} + k_s\rho_s)$$

Slope Factors and Reference Doses Used for Iowa Tier 1 Table Generation

Chemical	SF_i((kg-day)/mg)	SF_o ((kg-day)/mg)	RfD_i(mg/(kg-day))	RfD_o(mg/(kg-day))
Benzene	0.029	0.029	----	----
Toluene	----	----	0.114	0.2
Ethylbenzene	----	----	0.286	0.1

Chemical	SF_i((kg-day)/mg)	SF_o ((kg-day)/mg)	RfD_i(mg/(kg-day))	RfD_o(mg/(kg-day))
Xylenes	----	----	2.0	2.0
Naphthalene	----	----	0.004	0.004
Benzo(a)pyrene	6.1	7.3	----	----
Benz(a)anthracene	0.61	0.73	----	----
Chrysene	0.061	0.073	----	----

Appendix B – Tier 2 Equations and Parameter Values (Revised Model)

All Tier 1 equations and parameters apply at Tier 2 except as specified below.

Equation for Tier 2 Groundwater Contaminant Transport Model

Equation (1)

$$C(x) = C_s \exp\left(\frac{x_m}{2\alpha_x}\left[1-\sqrt{1+\frac{4\lambda\alpha_x}{u}}\right]\right) erf\left(\frac{S_w}{4\sqrt{\alpha_y x_m}}\right) erf\left(\frac{S_d}{4\sqrt{\alpha_z x_m}}\right)$$

Equation (2)

Where $x_m = ax + bx^c$

The value of X_m is computed from Equation (2), where the values for a, b and c in Equation (2) are given in Table 1.

Table 1. Parameter Values for Equation (2)

Chemical	a	b	c
Benzene	1	0.000000227987	3.929438689
Toluene	1	0.000030701	3.133842393
Ethylbenzene	1	0.0001	2.8
Xylenes	1	0.0	0.0
TEH-Diesel	1	0.000000565	3.625804634
TEH-Waste Oil	1	0.000000565	3.625804634
Naphthalene	1	0	0

Variable definitions

x: distance in the x direction downgradient from the source

erf( ): the error function

C(x): chemical concentration in groundwater at x

C_S: Source concentration in groundwater (groundwater concentration at x=0)

S_W: width of the source (perpendicular to x)

S_d: vertical thickness of the source

u: groundwater velocity (pore water velocity); u=Ki/θe

K: hydraulic conductivity

i: groundwater head gradient

θe: effective porosity

λ: first order decay coefficient, chemical specific

αx, αy, αz: dispersivities in the x, y and z directions, respectively

For the following lists of parameters, one of three is required: site-specific measurements, defaults or the option of either (which means the default may be used or replaced with a site-specific measurement).

Soil parameters

Parameter		Default Value	Required
ρ_s	soil bulk density	1.86 g/cm^3	option
f_{oc}	fraction organic carbon in the soil	0.01 kg-C/kg-soil	option
θ_T	total soil porosity	0.3cm^3-voids/cm^3-soil	option

Parameter		Default Value	Required
θ_{as}	volumetric air content in vadose zone	0.2cm^3-air/cm^3-soil	default
θ_{ws}	volumetric water content in vadose zone	0.1cm^3-H_2O/cm^3-soil	default
θ_{acrack}	volumetric air content in foundation/wall cracks	0.2cm^3-air/cm^3-soil	default
θ_{wcrack}	volumetric water content in foundation/wall cracks	0.1cm^3-H_2O/cm^3-soil	default
I	infiltration rate of water through soil	7 cm/year	default

If the total porosity is measured, assume 1/3 is air filled and 2/3 is water filled for determining the water and air fraction in the vadose zone soil and floor cracks.

Groundwater Transport Modeling Parameters

Parameter		Default Value	Required
K	hydraulic conductivity	16060 cm/year	site-specific
i	groundwater head gradient	0.01 cm/cm	site-specific
S_w	width of the source	use procedure specified in 135.10(2)	site-specific
S_d	vertical thickness of the source	3 m	default
α<fo:wrapper font-size="9pt" font-family="Arial">x</fo:wrapper>	dispersivity in the x direction	0.1x	default
α<fo:wrapper font	dispersivity in the y direction	<fo:wrapper font-size="9pt" font-family="Arial">0.33</fo:wrapper>α<fo:wrapper font-size="9pt" font-family="Arial">x</fo:wrapper>	default

Parameter		Default Value	Required
t-size="9pt" font-family="Arial">y</fo:wrapper>			
α<fo:wrapper font-size="9pt" font-family="Arial">z</fo:wrapper>	dispersivity in the z direction	<fo:wrapper font-size="9pt" font-family="Arial">0.05</fo:wrapper>α<fo:wrapper font-size="9pt" font-family="Arial">x</fo:wrapper>	default
θ<fo:wrapper font-size="9pt" font-fam	effective porosity	0.1	default

Parameter		Default Value	Required
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where u=Ki/θe

First-order Decay Coefficients

Chemical	<fo:wrapper font-size="9pt" font-family="Arial">Default Value</fo:wrapper>λ<fo:wrapper font-size="9pt" font-family="Arial">(d-1)</fo:wrapper>	Required
Benzene	0.000127441	default
Toluene	0.0000208066	default
Ethylbenzene	0.0	default
Xylenes	0.0005	default
Naphthalene	0.00013	default
TEH-Diesel	0.0000554955	default
TEH-Waste Oil	0.0000554955	default

Other Parameters for Groundwater Vapor to Enclosed Space

Parameter		Default Value	Required
Lgw	depth to groundwater from the enclosed space foundation	1 cm	option
L_B	enclosed space volume/infiltration area ratio	200 cm	option
ER (s-1)	enclosed space air exchange rate	0.00014	default
Lcrack	enclosed space foundation or wall thickness	15 cm	default
η	areal fraction of cracks in foundation/wall	0.01	default

Other Parameters for Soil Vapor to Enclosed Space

Parameter		Default Value	Required
L_s	depth to subsurface soil sources from the enclosed space foundation	1 cm	option
L_B	enclosed space volume/infiltration area ratio	250 cm *	option
ER (s-1)	enclosed space air exchange rate	0.000185 *	default
Lcrack	enclosed space foundation or wall thickness	15 cm	default
η	areal fraction of cracks in foundation/wall	0.01	default

*These values are an average of residential and nonresidential factors.

Soil Leaching to Groundwater

Parameter		Default Value	Required
δ	<fo:wrapper font-size="9pt">groundwater mixing zone</fo:wrapper>	2 m	default

Building Parameters for Iowa Tier 2

Parameter		Residential	Nonresidential
ER (s-1)	enclosed space air exchange rate	0.00014	0.00023
L_B	enclosed space volume/infiltration area ratio	200 cm	300 cm

Other Parameters

For Tier 2, the following are the same as Tier 1 values (refer to Appendix A): chemical-specific parameters, slope factors and reference doses, and exposure factors (except for those listed below).

Exposure Factors for Tier 2 Groundwater Vapor to Enclosed Space Modeling:

Potential Residential: use residential exposure and residential building parameters.

Potential Nonresidential: use nonresidential exposure and nonresidential building parameters.

Diesel and Waste Oil

Diesel and Waste Oil			Chemical-Specific Values for Tier 1			
Media	Exposure Pathway	Receptor	Naphthalene	Benzo(a) pyrene	Benz(a) anthracene	Chrysene
Groundwater (ug/L)	Groundwater Ingestion	actual	150	0.012	0.12	1.2
		potential	150	1.2	12.0	NA
	Groundwater Vapor to Enclosed Space	all	4,440	NA	NA	NA
	Groundwater to	all	150	1.2	12.0	NA

Diesel and Waste Oil			Chemical-Specific Values for Tier 1			
Media	Exposure Pathway	Receptor	Naphthalene	Benzo(a) pyrene	Benz(a) anthracene	Chrysene
	~~Plastic~~ Water Line					
	Surface Water	all	150	1.2	12.0	NA
Soil (mg/kg)	Soil Leaching to Groundwater	all	7.6	NA	NA	NA
	Soil Vapor to Enclosed Space	all	95	NA	NA	NA
	Soil to ~~Plastic~~ Water Line	all	21	NA	NA	NA

Due to difficulties with analytical methods for the four individual chemicals listed in the above table, Total Extractable Hydrocarbon (TEH) default values were calculated for each chemical, using the assumption that diesel contains 0.2% napthalene, 0.001% benzo(a)pyrene, 0.001% benz(a)anthracene, and 0.001% chrysene. Resulting TEH Default Values are shown in the following table.

Diesel			TEH Default Values			
Media	Exposure Pathway	Receptor	Naphthalene	Benzo(a) pyrene	Benz(a) anthracene	Chrysene
Groundwater (ug/L)	Groundwater Ingestion	actual	75,000	1,200	12,000	120,000
		potential	75,000	120,000	1,200,000	NA
	Groundwater Vapor to Enclosed Space	all	2,200,000	NA	NA	NA
	Groundwater to ~~Plastic~~ Water Line	all	75,000	120,000	1,200,000	NA
	Surface Water	all	75,000	120,000	1,200,000	NA
Soil (mg/kg)	Soil Leaching to Groundwater	all	3,800	NA	NA	NA
	Soil Vapor to Enclosed Space	all	47,500	NA	NA	NA
	Soil to ~~Plastic~~ Water Line	all	10,500	NA	NA	NA

The lowest TEH default value for each pathway (shown as a shaded box) was used in the Tier 1 Table.
Due to difficulties with analytical methods for the four individual chemicals, Total Extractable Hydrocarbon (TEH) default values were calculated for each chemical, using the assumption that waste oil contains no

naphthalene, 0.003% benzo(a)pyrene, 0.003% benz(a)anthracene, and 0.003% chrysene. Resulting TEH Default Values are shown in the following table.

Waste Oil			TEH Default Values			
Media	Exposure Pathway	Receptor	Naphthalene	Benzo(a) pyrene	Benz(a) anthracene	Chrysene
Groundwater (ug/L)	Groundwater Ingestion	actual	NA	400	4,000	40,000
		potential	NA	40,000	400,000	NA
Groundwater (ug/L)	Groundwater Vapor to Enclosed Space	all	NA	NA	NA	NA
	Groundwater to ~~Plastic~~ Water Line	all	NA	40,000	400,000	NA
	Surface Water	all	NA	40,000	400,000	NA
Soil (mg/kg)	Soil Leaching to Groundwater	all	NA	NA	NA	NA
	Soil Vapor to Enclosed Space	all	NA	NA	NA	NA
	Soil to ~~Plastic~~ Water Line	all	NA	NA	NA	NA

The lowest TEH default value for each pathway (shown as a shaded box) was used in the Tier 1 Table.

Groundwater to Water Line

Research references indicated PVC lines could be affected in grossly-contaminated conditions. Saturation levels were observed as a starting point for determination of target levels. These saturation levels were determined as follows:

Total BTEX: 123.6 mg/L or 123,600 ug/L, rounded to 120,000 ug/L

Benzene 63.0 mg/L or 63,000 ug/L, rounded to 60,000 ug/L

Toluene 51.3 mg/L or 51,300 ug/L, rounded to 50,000 ug/L

The "final" determined target levels adjusted for the uncertainties noted was agreed to be a calculated value 1/8 (12.5%) of the saturation starting points, thus, the target levels for the gasoline-derived BTEX compounds are as follows:

	PVC MAINS	PVC SERVICESPE/PB/AC	Existing	
Benzene	7,500 ug/L	3,750 ug/L	200 ug/L	290 ug/

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Toluene	6,250 ug/L	3,125 ug/L	3,125 ug/L	7,300 ug/L
Ethylbenzene	22,950 ug/L	11,475 ug/L	3,400 ug/L	3,700 ug/L
Xylenes	71,250 ug/L	35,625 ug/L	19,000 ug/L	73,000 ug/L

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Soil to Water Line

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The target levels calculated and applicable to all water lines within 10 feet of a soil plume defined to these limits:

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	Proposed	Existing
Benzene	2.0 mg/Kg	1.8 mg/Kg
Toluene	3.25 mg/Kg	120 mg/Kg
Ethylbenzene	26 mg/Kg	15 mg/Kg
Xylenes	79 mg/Kg	NA

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Appendix B-1 – Tier 2 Equations and Parameter Values (Old Model)

All Tier 1 equations and parameters apply at Tier 2 except as specified below.

Equation for Tier 2 Groundwater Contaminant Transport Model

$$C(x) = C_s \exp\left(\frac{x}{2\alpha_x}\left[1-\sqrt{1+\frac{4\lambda\alpha_x}{u}}\right]\right)\operatorname{erf}\left(\frac{S_w}{4\sqrt{\alpha_y x}}\right)\operatorname{erf}\left(\frac{S_d}{4\sqrt{\alpha_z x}}\right)$$

Variable definitions

x: distance in the x direction downgradient from the source

erf( ): the error function

C(x): chemical concentration in groundwater at x

C_S: Source concentration in groundwater (groundwater concentration at x=0)

S_W: width of the source (perpendicular to x)

S_d: vertical thickness of the source

u: groundwater velocity (pore water velocity); u=Ki/θe

K: hydraulic conductivity

i: groundwater head gradient

θe: effective porosity

λ: first-order decay coefficient, chemical specific

αx, αy, αz: dispersivities in the x, y and z directions, respectively

For the following lists of parameters, one of three is required: site-specific measurements, defaults or the option of either (which means the default may be used or replaced with a site-specific measurement).

Soil parameters

Parameter		Default Value	Required
ρ_s	soil bulk density	1.86 g/cm^3	option
f_{oc}	fraction organic carbon in the soil	0.01 kg-C/kg-soil	option
θ_T	total soil porosity	0.3cm^3-voids/cm^3-soil	option
θ_{as}	volumetric air content in vadose zone	0.2cm^3-air/cm^3-soil	default
θ_{ws}	volumetric water content in vadose zone	0.1cm^3-H_2O/cm^3-soil	default
θ_{acrack}	volumetric air content in foundation/wall cracks	0.2cm^3-air/cm^3-soil	default
θ_{wcrack}	volumetric water content in foundation/wall cracks	0.1cm^3-H_2O/cm^3-soil	default
I	infiltration rate of water through soil	7 cm/year	default

If the total porosity is measured, assume 1/3 is air filled and 2/3 is water filled for determining the water and air fraction in the vadose zone soil and floor cracks.

Groundwater Transport Modeling Parameters

Parameter	Default Value	Required

Parameter		Default Value	Required
K	hydraulic conductivity	16060 cm/year	site-specific
i	groundwater head gradient	0.01 cm/cm	site-specific
S_w	width of the source	use procedure specified in 135.10(2)	site-specific
S_d	vertical thickness of the source	3 m	default
α<fo:wrapper font-size="7pt" font-family="Arial">x</fo:wrapper>	dispersivity in the x direction	0.1x	default
α<fo:wrapper font-size="7pt" font-family="Arial">y</fo:wrapper>	dispersivity in the y direction	<fo:wrapper font-size="7pt" font-family="Arial">0.33</fo:wrapper>α<fo:wrapper font-size="7pt" font-family="Arial">x</fo:wrapper>	default
α<fo:wrapper font-size="7pt" font-family="Arial">z</fo:wrapper>	dispersivity in the z direction	<fo:wrapper font-size="7pt" font-family="Arial">0.05</fo:wrapper>α<fo:wrapper font-size="7pt" font-family="Arial">x</fo:wrapper>	default
θ<fo:wrapper font-size="7pt" font-family="Arial">e</fo:wrapper>	effective porosity	0.1	default

where u=Ki/θe

Groundwater Transport Modeling Parameters (continued)

First-order Decay Coefficients

Chemical	<fo:wrapper font-size="7pt" font-family="Arial">Default Value</fo:wrapper>λ <fo:wrapper font-size="7pt" font-family="Arial"> (d-1)</fo:wrapper>	Required
Benzene	0.0005	default
Toluene	0.0007	default
Ethylbenzene	0.00013	default
Xylenes	0.0005	default
Naphthalene	0.00013	default
Benzo(a)pyrene	0	default
Benz(a)anthracene	0	default
Chrysene	0	default

Other Parameters for Groundwater Vapor to Enclosed Space

Parameter		Default Value	Required
Lgw	depth to groundwater from the enclosed space foundation	1 cm	option
L_B	enclosed space volume/infiltration area ratio	200 cm	option
ER (s-1)	enclosed space air exchange rate	0.00014	default
Lcrack	enclosed space foundation or wall thickness	15 cm	default
η	areal fraction of cracks in foundation/wall	0.01	default

Other Parameters for Soil Vapor to Enclosed Space

Parameter		Default Value	Required
L_s	depth to subsurface soil sources from the enclosed space foundation	1 cm	option
L_B	enclosed space volume/infiltration area ratio	250 cm *	option
ER (s-1)	enclosed space air exchange rate	0.000185 *	default
Lcrack	enclosed space foundation or wall thickness	15 cm	default
η	areal fraction of cracks in foundation/wall	0.01	default

*These values are an average of residential and nonresidential factors.

Soil Leaching to Groundwater

Parameter		Default Value	Required
δ	<fo:wrapper font-size="9pt">groundwater mixing zone</fo:wrapper>	2 m	default

Building Parameters for Iowa Tier 2

Parameter		Residential	Nonresidential
ER (s-1)	enclosed space air exchange rate	0.00014	0.00023
L_B	enclosed space volume/infiltration area ratio	200 cm	300 cm

Other Parameters

For Tier 2, the following are the same as Tier 1 values (refer to Appendix A): chemical-specific parameters, slope factors and reference doses, and exposure factors (except for those listed below).

Exposure Factors for Tier 2 Groundwater Vapor to Enclosed Space Modeling:

Potential Residential: use residential exposure and residential building parameters.

Potential Nonresidential: use nonresidential exposure and nonresidential building parameters.

Diesel and Waste Oil

Diesel and Waste Oil			Chemical-Specific Values for Tier 1			
Media	Exposure Pathway	Receptor	Naphthalene	Benzo(a) pyrene	Benz(a) anthracene	Chrysene
Groundwater (ug/L)	Groundwater Ingestion	actual	150	0.012	0.12	1.2
		potential	150	1.2	12.0	NA
	Groundwater Vapor to Enclosed Space	all	4,440	NA	NA	NA
	Groundwater to ~~Plastic~~ Water Line	all	150	1.2	12.0	NA
	Surface Water	all	150	1.2	12.0	NA
Soil (mg/kg)	Soil Leaching to Groundwater	all	7.6	NA	NA	NA
	Soil Vapor to Enclosed Space	all	95	NA	NA	NA
	Soil to ~~Plastic~~ Water Line	all	21	NA	NA	NA

Due to difficulties with analytical methods for the four individual chemicals listed in the above table, Total Extractable Hydrocarbon (TEH) default values were calculated for each chemical, using the assumption that

diesel contains 0.2% napthalene, 0.001% benzo(a)pyrene, 0.001% benz(a)anthracene, and 0.001% chrysene. Resulting TEH Default Values are shown in the following table.

Diesel			TEH Default Values			
Media	Exposure Pathway	Receptor	Naphthalene	Benzo(a) pyrene	Benz(a) anthracene	Chrysene
Groundwater (ug/L)	Groundwater Ingestion	actual	75,000	1,200	12,000	120,000
		potential	75,000	120,000	1,200,000	NA
	Groundwater Vapor to Enclosed Space	all	2,200,000	NA	NA	NA
	Groundwater to ~~Plastic~~ Water Line	all	75,000	120,000	1,200,000	NA
	Surface Water	all	75,000	120,000	1,200,000	NA
Soil (mg/kg)	Soil Leaching to Groundwater	all	3,800	NA	NA	NA
	Soil Vapor to Enclosed Space	all	47,500	NA	NA	NA
	Soil to ~~Plastic~~ Water Line	all	10,500	NA	NA	NA

The lowest TEH default value for each pathway (shown as a shaded box) was used in the Tier 1 Table.
Due to difficulties with analytical methods for the four individual chemicals, Total Extractable Hydrocarbon (TEH) default values were calculated for each chemical, using the assumption that waste oil contains no naphthalene, 0.003% benzo(a)pyrene, 0.003% benz(a)anthracene, and 0.003% chrysene. Resulting TEH Default Values are shown in the following table.

Waste Oil			TEH Default Values			
Media	Exposure Pathway	Receptor	Naphthalene	Benzo(a) pyrene	Benz(a) anthracene	Chrysene
Groundwater (ug/L)	Groundwater Ingestion	actual	NA	400	4,000	40,000
		potential	NA	40,000	400,000	NA
Groundwater (ug/L)	Groundwater Vapor to Enclosed Space	all	NA	NA	NA	NA
	Groundwater to ~~Plastic~~ Water Line	all	NA	40,000	400,000	NA

Waste Oil			TEH Default Values			
Media	Exposure Pathway	Receptor	Naphthalene	Benzo(a) pyrene	Benz(a) anthracene	Chrysene
	Surface Water	all	NA	40,000	400,000	NA
Soil (mg/kg)	Soil Leaching to Groundwater	all	NA	NA	NA	NA
	Soil Vapor to Enclosed Space	all	NA	NA	NA	NA
	Soil to ~~Plastic~~ Water Line	all	NA	NA	NA	NA

The lowest TEH default value for each pathway (shown as a shaded box) was used in the Tier 1 Table.

APPENDIX C

DECLARATION OF RESTRICTIVE COVENANTS

Rescinded IAB 7/19/06, effective 8/23/06

APPENDIX D

IOWA DEPARTMENT OF NATURAL RESOURCES

NO FURTHER ACTION CERTIFICATE

This document certifies that the referenced underground storage tank site has been classified by the Iowa Department of Natural Resources (IDNR) as "no action required" as provided in the 1995 Iowa Code Supplement 455B.474(1)"h"(1). This certificate may be recorded as provided by law.

<fo:wrapper font-size="8pt" font-family="Arial">ISSUED TO: </fo:wrapper>

<fo:wrapper font-size="8pt" font-family="Arial">OWNERS/OPERATORS OF TANKS</fo:wrapper>

<fo:wrapper font-size="8pt" font-family="Arial">DATE OF ISSUANCE:</fo:wrapper>

<fo:wrapper font-size="8pt" font-family="Arial">IDNR FILE REFERENCES: LUST # </fo:wrapper>

<fo:wrapper font-size="8pt" font-family="Arial">REGISTRATION #</fo:wrapper>

<fo:wrapper font-size="8pt" font-family="Arial">LEGAL DESCRIPTION OF UNDERGROUND STORAGE TANK SITE:</fo:wrapper>

Issuance of this certificate does not preclude the IDNR from requiring further corrective action due to new releases and is based on the information available to date. The department is precluded from requiring additional corrective action solely because governmental action standards are changed. See 1995 Iowa Code Supplement 455B.474(1)"h"(1).

This certificate does not constitute a warranty or a representation of any kind to any person as to the environmental condition, marketability or value of the above referenced property other than that certification required by 1995 Iowa Code Supplement 455B.474(1)"h".

These rules are intended to implement Iowa Code sections 455B.304, 455B.424 and 455B.474.

[Filed emergency 9/20/85—published 10/9/85, effective 9/20/85]
[Filed emergency 11/14/86—published 12/3/86, effective 12/3/86]
[Filed emergency 12/29/86—published 1/14/87, effective 1/14/87]
[Filed 5/1/87, Notice 1/14/87—published 5/20/87, effective 7/15/87]
[Filed emergency 9/22/87—published 10/21/87, effective 9/22/87]
[Filed 2/19/88, Notice 11/18/87—published 3/9/88, effective 4/13/88]
[Filed emergency 10/24/88—published 11/16/88, effective 10/24/88]
[Filed 7/21/89, Notice 2/22/89—published 8/9/89, effective 9/13/89]
[Filed emergency 8/25/89—published 9/20/89, effective 8/25/89]
[Filed 8/31/90, Notice 3/21/90—published 9/19/90, effective 10/24/90]
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[Filed emergency 8/28/91—published 9/18/91, effective 8/28/91]
[Filed emergency 2/21/92 after Notice 9/18/91—published 3/18/92, effective 2/21/92]
[Filed 9/24/93, Notice 3/17/93—published 10/13/93, effective 11/17/93]
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[1] July 15, 1987, effective date of 135.9(4) delayed 70 days by Administrative Rules Review Committee at its June 1987 meeting.

[2] August 6, 2008, effective date of **ARC 6892B** delayed 70 days by Administrative Rules Review Committee at its July 2008 meeting. At its meeting held October 14, 2008, the Committee delayed until adjournment of the 2009 Session of the General Assembly the following provisions: **567—135.2(455B)**, definition of "Sensitive area"; **135.9(4)"f"**; **135.10(4)"a,"** last sentence: "A public water supply screening and risk assessment must be conducted in accordance with 135.10(4)"f" for this pathway" and **135.10(4)"b,"** last sentence of the first paragraph: "The certified groundwater professional or the department may request additional sampling of drinking water wells and non-drinking water wells as part of its evaluation"; **135.10(4)"f"**; **135.10(11)"h."**